THE

MECHANICS' MAGAZINE,

AND

JOURNAL OF ENGINEERING, AGRICULTURAL MACHINERY, MANUFACTURES, AND SHIPBUILDING.

VOL. VIII.

(NEW SERIES.)

JULY TO DECEMBER, 1862.

LONDON:

ROBERTSON, BROOMAN, & CO., "MECHANICS' MAGAZINE" AND PATENT OFFICES,

166, FLEET STREET, E.C.

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ILLUSTRATED ARTICLES.

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, JULY 4, 1862.

A FLOATING SANITARIUM.

THE unhealthiness of Calcutta, as a place of residence for Europeans, has made itself painfully apparent during the last few years, and has cost this country many valuable lives. The site of that city is, indeed, one of the worst that can be conceived. It was originally a dismal swamp, and drainage now is next to an impossibility. Calcutta is, however, to all intents and purposes the metropolis of British India, and the original mistake of founding it in so pestiferous a locality, entails upon its inhabitants a perpetual penalty, in the form of fever, or other deadly diseases. We question whether a single European whose fortune, or rather, whose fate, causes him, for any space of time, to become a resident, escapes an attack more or less virulent of the complaints peculiar to the plague-ridden place. Under these circumstances it becomes the duty of the Home, and Local Governments to do all that science can suggest, or practical experience dictate, to mitigate the evils which surround its inhabitants. We have known many instances of young Englishmen, engineers and others, who have gone to Calcutta only to find there their graves, or to be so prostrated by illness as to be compelled to return immediately to their native land, while the mortality among troops stationed there has passed into a proverb.

One very sensible movement is, we are glad to find, being made at Calcutta, as a remedial effort, and it is that of establishing at some distance from the city a floating sanitarium. This will be placed at the mouth of the Hooghly, within a day's sail of the capital, and not out of reach of the post-office and the electric telegraph. The steamship Bentinck, once so well known in the service of the Peninsular and Oriental Company, but some time since purchased by the Government for the purpose of transporting troops, is rapidly undergoing conversion into a sanitarium for invalids. Ere many weeks elapse, therefore, in all probability the old slow-going steamer will have become a great floating sanitary hotel, and be moored at the entrance to the Hooghly. The precise spot selected for this ark of refuge is, we are told, a creek near Hidgellee, where she will be exposed to the health-giving breezes of the Bay of Bengal, though partially sheltered from its storms, and surrounded by a fine sandy beach. The lower deck of the quondam steamer is being fitted up for the reception of invalid private soldiers, and the upper deck for such officers as have heretofore been accommodated in the Calcutta hospital, and for whom change of air has been recommended by the medical attendants of that place. The space on the ship hitherto occupied by the enormous paddle-boxes, and wheels will be devoted to the formation of baths, wherein the convalescent may daily disport himself in salt water, without fear of sun-stroke or the attacks of sharks.

While the main object is to receive military invalids on board the sanitarium, it is understood that the advantages accruing from its establishment will be open, on payment, to the general public, and thus there will be a chance of making it at least partially self-supporting. It will supersede the common, but unsatisfactory expedient of a run out to sea in an uncomfortable "tug," or a residence for a week or two in a small pilot vessel. Invalids who dread the sandheads when a gale is on, will be attracted by the prospect of a week's or a month's location in a sheltered sandy bay, and the fear consequently is that it may become too popular. We are assured that, if properly managed, the floating sanitarium will become a blessing to the people of Calcutta; and should the demand for its accommodation be found too great, another hulk may easily be provided as a supplement to the Bentinck. The tariff of rates for admission and attendance should be properly fixed, and books and amusements furnished for the semi-invalids. Boating in the creek, and walking exercise on the shore, ought also to be encouraged; but, doubtless, aids and adjuncts of various kinds will soon suggest themselves and be adopted. A small steamer will have to be in constant communication with the city and the ship, and regular postal and telegraphic arrangements should be made. Thus the overworked and over-anxious merchant or official who, though not positively ill, is in a fair way of becoming so, may take a run down to sea-quarters, and find "health in the breeze, and "shelter in the storm."

Those who know anything of life in Calcutta are aware that a facility of the kind described will be invaluable. A stay of a few days on board the Bentinck may save lives worth "a "king's ransom," or render it unnecessary for men, whose services are indispensable to India, to rush home in order to re-establish broken health.

Under these circumstances, we shall watch with considerable interest the development of the floating sanitarium, though there can be no doubt of its speedy and permanent success.

OUR DOCKYARDS AND ARSENALS.

THE systematic perversion by Government of facts and arguments relating to this subject is remarkable. Is the motive ignorance, indifference, or design? We have a strong impression, but we will not express it. Whatever the motive, the course taken by Ministers, in Parliament and through the press, has become a scandal. We will state facts, and leave our readers to judge whether we prove our assertion or overrate its importance.

Great surprise has been excited by the contradictions of official authorities on the results of target trials at Shoeburyness. They are palpable and disgraceful enough, but are easily accounted for. To answer the purposes of Government, two results of a completely opposite character had to be proved from the same experiments. The power of resistance of the Warrior target and the penetrating effect of the Armstrong guns had both to be established. This was an unlucky dilemma, and betrayed the authorities into misrepresentations which have damaged their reputation and broken down their case. The natural indignation of the public, plainly expressed in the House of Commons, compelled the Government to abandon the Spithead Forts.

The House, having condemned fixed forts, has recorded its opinion that they are not the right kind of defence for the entrance of the channel leading to Portsmouth harbour; but, in coming to that conclusion, it does not deny the necessity of defences at that point. On the contrary, the House is of opinion that the effectual defence of the Channel is a matter of paramount importance. Government are of the same opinion, and, so far, nobody dissents from the Defence Commissioners, who are unanimous in recommending that the Spithead Channel should be strongly protected. The country, which begins to understand the question, is willing to grant any sum necessary to guarantee the safety of Portsmouth Arsenal and Dockyards, and the immense fleet in ordinary or in dock in that harbour. It is politic and patriotic to fix Government with that responsibility. This point being determined, the debate is narrowed into a small compass. The channel between the Horse Sand, No-Man's-Land, and the Sturbridge Shoals must be protected. If Ministers now deny that necessity they will stultify themselves, and leave the country to believe that the plan of erecting fixed forts on those frail foundations was a proposal for a monstrous job. We do not believe such an intention existed. We believe ministers were convinced by the Report of the Defence Commissioners, that the most urgent duty of the War Department and the Admiralty was to defend the important channel at Spithead from an attack by sea.

The House, by its vote, has decided that fixed forts are not the right sort of defences, and that floating batteries are. Parliament, to be consistent, should order that the sums saved from being wasted on the former should be usefully appropriated to the latter, for a purpose which all parties agree must be effected. By this course ministers will be fixed to the real question, and they will not succeed in entangling the House in a general discussion.

The distinction should also be drawn by members, who understand the subject, between ships and floating batteries, which it is an artifice of ministers to confound, as if they where the same thing, whereas they will differ as much in their form and construction as a fixed fort differs from a ship, with the sole exception that the fort is not afloat.

Another artifice of Government, which requires to be exposed, is their attempt to create confusion relative to harbour defences on the land side and on the sea side. It is obvious to reflection that these two modes of protection are wholly independent of each other, as regards operations near the *Shoals*, where the Spithead Forts were proposed to be erected; so that any idea of land defences in that direction is simply ridiculous.

What is the use of raising issues or arguing points on which there is no difference of opinion? Government, knowing their case is bad, are unwilling to meet their adversaries on fair ground. Unable to offer any good reasons in support of their object, they endeavour to mislead by turning attention aside from the real question, and directing it to other matters about which everybody is agreed. If you cannot carry your point with your opponent by a direct attack, make a feint, try to deceive his vigilance, and steal a march upon him. These are the tactics of ministers. Defence on the land side—the construction of monster guns which will pierce iron plates at 2,000 yards—the capability of land forts to mount guns which ships cannot carry—protection against invasion,—these and other collateral points are raised, confounded, and discussed with simulated earnestness, as if they were the main question, when in fact they are quite beside it.

It may, however, be worth while to answer some of the fallacious arguments on the ministerial side. One case supposed is war with a maritime power having a navy able to cope with our own, and the danger to be guarded against is represented to be a landing on our coasts. At the moment of the threatened invasion our chief dependence must be on our fleet, to repel the aggressors. In any state of things, however well prepared we might be, all our resources would be put in motion to increase our naval armaments. At such a time the protection of our dockyards and arsenals from an attack on the side of the sea would be a supreme necessity; and if the

approach to those centres of our naval power were accessible to an enemy, they would become the first object of attack as a preliminary to a landing on our coasts. If he could enter Portsmouth harbour, he would do so, and by destroying our ships fitting in that port, he would prevent us from using the force which might render invasion impossible. Under these circumstances we ask which would be the best defence to the channel—fixed or floating forts?

The propriety of inland defences to our dockyards is not denied by the opponents of the Government proposals. It is only on the nature and extent of the works that opinions differ. But, however that may be, the necessity of land defences does not render the defences on the side of the sea less urgent. Of what avail would land defences be, if the Spithead Channel could be forced by a squadron of armour-plated vessels which might speedily destroy every vessel in the harbour or the dockyards? And be it remembered that this work of destruction could be accomplished by a few invulnerable gun-boats, if they succeeded in passing by the defences of the sea channel, as the Federal gun-boats did in the Mississipi.

We have now to consider which is the best kind of floating defence to an estuary or channel more than 1,000 yards across, leading to the harbour or arsenal to be protected. Many writers and speakers on this subject fall into a confusion of ideas, by not making a proper distinction between sea-going ships and floating batteries, or between the defence of a broad channel and a narrow river. Hence has arisen much misunderstanding of several important points. The forts, whether fixed or floating, are "*points d'appui;*" they are not the main line of battle, but supports to fighting ships. Whichever description of support is adopted, there must be a fleet of line-of-battle ships and gun-boats in addition. This necessity is foreseen and provided for in the Defence Commissioners' Report. These vessels are to do the active fighting part of the business; and if we are to be protected from hostile invasion, the "financial absurdity" of constructing these vessels, so much deprecated by the *Daily Telegraph*, must be perpetrated. Forts or no forts, we must possess so large a fleet of sea-going iron sides, moveable from port to port, that "we can bring to every accessible point of the "coast as many of those vessels as an invader "can bring against us."

The object of the bill before the House, as its title and provisions show, is the "defences "of the royal dockyards and arsenals." Its object is not the general defence of the country, and, therefore, notwithstanding Sir C. Lewis's ingenious sophistry, to import into the debate questions of invasion and landing on exposed parts of the coast, has no other object than to divert attention from the consideration of the most efficient means of defending our dockyards, which is the real matter for debate. The premier himself settled this point decisively, by the concluding words of his speech. "These "fortifications," he said, "are necessary to "defend the dockyards, which are essential to "the maintenance of our navy, that navy being "necessary to the country as an independent "nation."

To determine the relative value of these defences on the land side or on the sea side is a fair subject for controversy; but at this moment their relative urgency rather than their ultimate utility has to be decided. On this point we will confine our remarks to Portsmouth. It is our most important arsenal, and the principles which prevail there will be applicable to the other places mentioned in the bill. In the estimates a given sum is set down for Portsmouth. We will not stop to consider whether it be too much or too little. The point to determine is, "shall the sum, or the greater part of "it, be appropriated to works on Portsdown-hill, "and other points inland, or to floating batte- "ries in lieu of the forts intended to have been "erected on the Shoals at Spithead?" Should this question be put to the vote, if the House is consistent with its decision, which compelled the Government to abandon advanced forts, there can be no doubt there will be a large majority in favour of the floating batteries.

That question being carried, it should be followed by a resolution, declaring that two or more floating batteries are indispensable for the defence of Portsmouth harbour, and appropriating a sum for their immediate construction. Ministers cannot venture to oppose this resolution, at least to the extent of the sum intended to be applied to the Spithead Forts, as that sum will be disposable out of the £1,200,000, and it will thus be applied most efficiently for the defence of Portsmouth at this vulnerable point, which it is the main object of the Defence Commission and of Government to accomplish.

If ministers are pinned down to the real question by this course of proceeding, they will be driven to a surrender of their opposition to floating batteries, as complete as the abandonment of their plan for the construction of the Spithead Forts.

PATENTEES IN PARLIAMENT.

WE beg to call attention to an Act of Parliament which has just been passed, intituled, "An Act for rendering valid certain letters "patent granted to Thomas Webb, of Tulbury, "in the county of Derby, cotton spinner, and "James Craig, of the same place, manager."

It appears that letters patent were granted to Messrs. Webb and Craig for "improve- "ments applicable to spinning, doubling, wind- "ing, and warping yarns or threads," the 30th day of July, 1858. One of the conditions of the grant of the letters patent was that a stamp duty of fifty pounds should be paid, and the letters patent, stamped with a proper stamp, should be produced at the office of the Commissioners of Patents before the expiration of three years (30 July, 1861) from the date of the letters patent. The stamp duty was not paid, and the letters patent were not produced within the prescribed period; consequently the letters patent became void.

In the preamble of the Act, it is stated that the "non-payment of the stamp and the non- "production of the letters patent duly stamped "within the time limited for that purpose, "arose from inadvertence on the part of the "person employed by the said Thomas Webb "and James Craig to take the necessary steps "for payment of the said duty and production "of the said letters patent."

We hold Messrs. Webb and Craig and their agent to be inseparable in such a case; and as there was so long a period allowed for the payment of the stamp duty, we think the grounds upon which this expired patent has been resuscitated by Act of Parliament wholly inadequate. It is a most dangerous precedent, and may tend to make patentees careless of their own interests; for should the parties whom they employ and entrust with the necessary fees to effect the extension of the term of their patents betray their trust, they will fancy they can do as Messrs. Webb and Craig have done, and get a special Act passed for them.

What machinery may have been set in motion to get the Act passed, we are at a loss to conjecture; but we certainly think that the time of the legislature might be better occupied than by passing Acts to remedy the injury occurring to private parties through their own laches.

INSULATION FOR DEEP SEA CABLES.

INDIA-RUBBER.

THE report of the Board of Trade Committee, and the evidence of several eminent personages who attended before that body, had given rise to a hope that at some distant period, when experience had waited upon theory, india-rubber, in some form or other, might have taken its place by the side of gutta-percha, as a valuable addition to our material for insulating cables. Not that we supposed, under the most favourable circumstances, india-rubber would supersede gutta-percha in practical value; our endeavour in treating of the subject having ever been to hold the balance fairly between the two substances, simply inculcating caution and tentative action as regards the newer insulator before launching into its use for works of any great magnitude.

That this mode of dealing with the matter was the right one, as regards the deep interest which the public have in the future of long sea cables, is abundantly shown in a paper recently read by Mr. C. W. Siemens before the Institution of Civil Engineers. From the contents of that paper, its author, whose evidence before the Board of Trade Committee was strong in favour of india-rubber as against gutta-percha, would seem to have much modified his views in regard to both substances. He now, from further experience, has been enabled to perceive the advantage of that quality in gutta-percha which enables it to "*be put upon the wire in a plastic "state by a die process, giving greater security "against faults than the lapped india-rubber "covering. It is also,*" he says, "*less liable to "become sticky or semi-fluid when exposed to the "atmosphere, and resists the action of water more "perfectly.*" This ought surely to be conclusive in favour of the material so acting, especially as the supposed inferiority of the gutta-percha, as regards its inductive and insulating properties, has been completely set at rest by Professor Wheatstone, who writes to the Board of Trade Committee that pure gutta-percha (as it is now manufactured) closely assimilates to india-rubber in both these respects. It seems, therefore, somewhat illogical in Mr. Siemens to recommend as he does the union of caoutchouc and gutta-percha. Having, however, given his own opinion as to electrical advantages of india-rubber, he proceeds to say, that notwitstanding these assumed advantages, "*its gradual disso- "lution in sea water was a circumstance which "alone rendered it inadmissible for submarine "wires, unless it was securely inclosed in "another waterproof medium, and gutta-percha "appeared in every respect well suited for such "outer covering.*" An advantage of some importance, as regards cables for warm climates, is certainly claimed for india-rubber, namely, the power it is said to have of resisting heat; but in the next paragraph Mr. Siemens gives a particular caution against the application of heat in the process of covering the wire with rubber, as he says, "*it often entailed a gradual decom- "position of that material.*" Now, in addition to climatic heat, the rubber in the cable proposed by Mr. Siemens would be exposed to direct heat in the very application through the die of the gutta-percha, which is admitted to be required for its preservation.

One is, therefore, tempted to say "*cui bono*" to all this. Where is the use of incurring the large extra expense involved in this compound process, when the result is so practically untried, and so very problematical, that we our-

selves have seen a piece of insulation, in the form under discussion, wherein the two substances appeared as if through some antagonism in their respective natures they were in course of mutual decomposition? We do, at all events, know many important facts about gutta-percha. It improves by submersion in the sea. It is admitted on all sides to be an excellent insulator. It can be applied with the greatest facility; and there are somewhere about 10,000 miles of gutta-percha covered submarine telegraph wire in cables, which have worked well during several years, and show every possibility of continuing to do so.

LONDON MECHANICS' INSTITUTION.

WE are sorry to find that the above institution, which is by no means creditable to the mechanics of London to say, has contended against pecuniary difficulties for some years past, is now threatened with proceedings in chancery and proximate dissolution. This has arisen from a claim made for the payment of a mortgage debt of £1,500, recently incurred by the purchase of the premises. We cannot but feel greatly concerned that an institution which has effected so much good, should be thus placed in jeopardy, and we trust that some means may be devised for extricating it. No doubt the formation of relative institutions has had much to do with the difficulties past and present of this, the parent of them all, but we do not think that the advantages it offers, to *young* men especially, have been commensurately availed of.

We can, however, point to many instances where the evening classes and lectures, at the London Mechanics' Institution, have produced excellent fruit, and we know many men in high positions who owe their success largely to the early influences of the institution. On these grounds and others, then, we commend the Mechanics' Institution to the mechanical classes of the metropolis, and trust that a large accession of members may be the result of our appeal.

A committee has been formed with a view to raising the sum necessary for relieving the establishment—the people's college, as it may be termed—from the legal pressure which now weighs it down. Donations to this aid are received by various bankers, including Messrs. Smith, Payne and Smith; Messrs. Hanbury and Lloyd; Messrs. Ransom & Co.; at the Birkbeck Bank for deposits, and at the London Mechanics' Institution, Southampton Buildings, Chancery Lane.

LIFE-PRESERVING APPARATUS, &c., IN THE INTERNATIONAL EXHIBITION.

THE ladders and uncovered baskets whereby men formerly passed into collieries are now being gradually replaced by safety cages. Before describing those shown at the International Exhibition, it may be remarked that the object of these apparatus is to protect life if the rope or chain raising or lowering the miners should fail, or any debris or gearing should fall into the shaft. There is no law to compel proprietors of collieries to use safety cages. The Act on manslaughter would probably reach the owners of any mines where lives should happen now to be lost by the breaking or overwinding of a chain. A very distressing accident of this kind occurred in 1860, at Earl Granville's colliery, by which a number of men were killed through the overwinding of the rope of the ascending cage. In the previous year between one and two hundred people lost their lives, according to the colliery inspectors' reports, from causes which would have been obviated by the general use of safety cages. The principle of nearly all safety cages is the freeing of one or more levers which press against the guide rods fixed to the side of shafts, when the hauling tackle is not stretched by the chain. Mr. J. T. Calow exhibits in Class 1, No. 52. The improvement claimed in this invention is that the levers or grips are not disengaged whenever the cage is supported, as by resting on the ground. This apparatus has been beneficially in use for some time at the West Staveley Colliery, the viewer of which, Mr. Moody, states in writing that it has preserved life on three occasions. In the open court, Class 1 (which contains many objects of interest), there is erected in full size working order Aytoun's patent safety cage, described in a previous number. Mr. W. Heath Jordan likewise exhibits a model of a pit frame and safety cages.

For the raising and lowering of goods through the different floors of warehouses, and at railway stations to and from the platform, as at Bristol, the miners' cage is used. The patent Hoist Company, in Class 10, exhibit a safety cage which is designed to obtain the same result by an arrangement brought into action by centrifugal force. Watts's governor regulates the velocity of the cage in transit. The advantage obtained by this mode is that when a chain breaks the cage gradually descends. Patent cages on No. 52 principle could easily be constructed to enable the inmates to lower themselves on a chain breaking. Mr. George Dodman shows also, in Class 10, a patent safety hoist. The cage in this instance becomes stationary whether the chain breaks or is overwound. Messrs. Marcus Brown & Co. also show a safety cage.

The many contrivances invented for affording relief to the inmates of houses on fire have been well represented for some years past at the annual Exhibition of the Society of Arts. They principally consisted of chain ladders for attaching to upper window sills cages with incombustible curtains, lowered by cranes inserted into eye-bolts fixed in the wall. Some houses have still facilities permitting egress over the roof to the adjoining residence in cases of fire. These are all being superseded by the ladder fire-escapes; none like the two to be seen at the present Exhibition was shown in 1851. Mr. Clarke's improved fire-escape, Class 10, reaches 80 feet high. The underneath part of the centre ladder of this fire-escape is encircled by canvass rendered incombustible by being saturated in alum and chloride. A wire gauze further protects the canvass from the effects of flames. Into the wooden steps of the ladder are inlaid wire rope, sufficiently strong to bear the weight of several men. The improvement in Clarke's fire-escape is in the lever bars for raising the second ladder, which work on quadrants. This arrangement prevents a reoccurrence of the Bishopsgate-street accident, when the levers broke; falling on the people. All the lives in jeopardy were saved on this occasion. This fire-escape is so light that one man can wheel it easily. The Royal Society for the Protection of Life have purchased this fire escape for their station in front of the Royal Exchange. Messrs. Merryweather and Son exhibit in Class 7, No. 1928, a fire-escape constructed similar to those to be seen in many of the principal thoroughfares at night.

The mariner's daily risks appear to equal those of the miner. The sympathy for the former is displayed by the Royal National Life-boat Association, who possess a prominent stand in Class 12, containing models of rowing and sailing life-boats. Mr. Richardson shows a highly finished model of a patent tubular life-boat. Another inventor, Mr. Coryton, his vertical wave line system and atmospheric guide propeller life-boat. The noted life-boat named the Mary Anne, belonging to the ports of Hartlepool and Sunderland, is represented by a beautiful model. This boat was subjected some years since to many tests in Ramsgate harbour, and fully showed its capability of being able to right itself immediately when purposely capsized, particularly in the instance when the boat was under sail. The crew of the Mary Anne have received, since 1857, the sum of £250 from the Board of Trade, for saving life, besides salvage money for assisting vessels in distress.

The noble family of the Phipps date their rise from a man in a very humble calling, who formed the singular project of recovering the treasure sunk in a wrecked vessel, though the ship had been lost some sixty years before, on an uninhabited part of the American coast, rumour only pointing to its precise locality; yet this remarkable man, after years of labour, accompanied with great disappointments, finally succeeded in recovering a large amount of the long lost treasure. The diving apparatus so efficiently used to recover the gold in the Royal Charter, suggests whether it might not be beneficially used to obtain from the sea valuable property hidden many ages on different parts of the coasts. Heinkes's patent diving apparatus, No. 2296, Class 10, was employed for removing the old foundations at Westminster bridge, and is stated to have been in constant use for five years without any accident having occurred. Adjoining is "A. Siebe's" diving apparatus, used in the summer months from 1839 to 1844 inclusive, in clearing the anchorage at Spithead of the wrecks of the Royal George, of 104 guns, lost whilst engaged in partially careering the vessel in 1782, and the Edgar, of 70 guns, blown up and sunk in 1711. There is a very interesting copper pulley wheel shown, recovered from the wreck of the Mary Rose, sunk in the reign of Henry VIII. The workmanship and skill used in order to combine strength and lightness in this pulley wheel is remarkable; no improvement thereon could be effected at the present day.

GEORGE WALCOTT, C.E.

THE INTERNATIONAL EXHIBITION, 1862.

AMONGST the exhibitors in pipes, Mr. J. Chatterton, of Wharf-road, City-road, stands prominent in the scale of excellence (Class XXXI., No. 6376). He shows lead, composition, and pure block tin pipes of every variety of size and shape, and of the most perfect manufacture. Ordinary lead pipes of all sizes, from 1-32nd of an inch to 6 in. diameter, lead mouldings, polygonal, and multiple pipes, the latter being used for the purpose of conveying various liquids into spirit vaults, and are enclosed in the large pipe for neatness of appearance and facility of fixing on walls and down angles, &c. The three pipes combined are especially designed for domestic purposes, the object being to convey to the different parts of the house hard and soft water and gas. Lead pipes, coated internally with pure tin, for use in those localities where the water forms poisonous salts with the ordinary lead pipe. Lead pipes are shown, lined with gutta-percha, for similar purposes as last named. These are also, by their lightness and remarkable strength, particularly suitable for conveying water in mountainous countries, where they would have to sustain a great pressure; and, from the frost-resisting properties of the gutta-percha, they are invaluable in cold latitudes. Brass union joints are exhibited, showing that the lengths may be connected as easily and as perfectly as ordinary lead pipes. Composition tubes for gas, which show a great superiority in material and manufacture, and placed by the side of tin tubes, not only rival them in brilliancy, but are found also to equal them in hardness and toughness. The pure block tin tube is deserving of especial notice. The specimens here exhibited are quite unequalled. The upright, 10ft. length, 3in. internal diameter, is the largest size ever made in long lengths; it is as smooth and bright inside as outside. Mr. Chatterton also exhibits specimens of cylindrical projectiles for smooth-bore guns, which are intended to obviate the necessity of using a rifle-barrel, with its tendency to fouling, and at the same time to secure that force and accuracy which under ordinary circumstances are only attainable by the use of the rifle. Instead of receiving a rotary motion, as heretofore, from a grooved barrel, it derives it from the resistance of the atmosphere acting upon a suitable helical apparatus in the bullet itself. The projectile is in shape a hollow cylinder, open at both ends, and the internal screw is made of different patterns, which can only be understood by a personal inspection. Altogether, the collection of samples exhibited by Mr. Chatterton is very com-

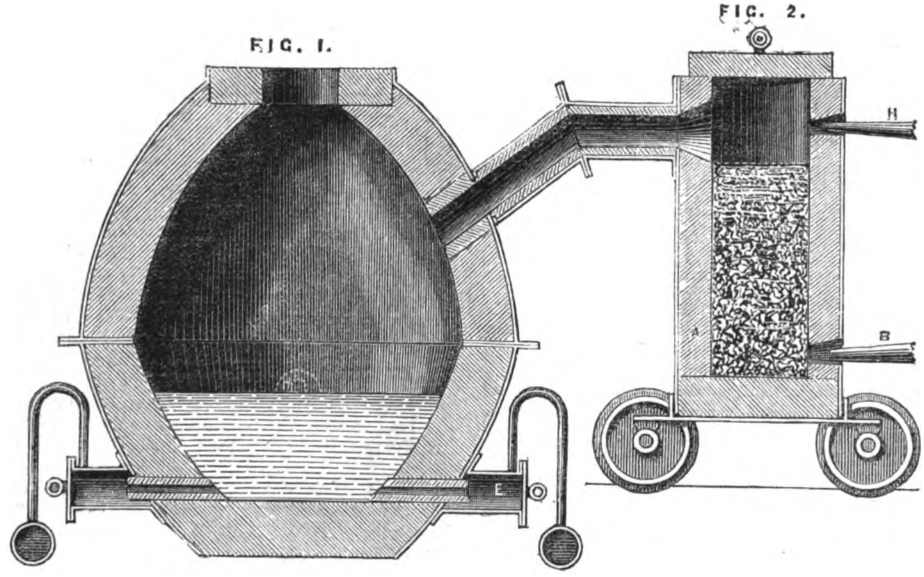
ple'e and interesting, and shows especially the perfection to which the art of pipe-making has arrived in this country.

SHIPS' RUDDERS.

An interesting trial recently took place at Portsmouth of a plan, patented by Captain Warren, R.N., for steering ships under steam by a rudder placed in the vessel's bow. The chief merits claimed by Captain Warren for his patented rudder are that it is an auxiliary steering power to the ordinary rudder, assisting the ship to turn quicker when necessary, as might be the case under the fire of an enemy's battery, and also that it should replace the ordinary rudder in the event of any accident happening to the latter, either from the weather or the shot of the enemy. The vessel with which the principle was tested was the Princess Royal, a small paddle steamer belonging to the Portsmouth and Isle of Wight Steam Packet Company, and to the bows of which a rudder had been temporarily fitted. The rudder had, however, an area of only nine feet, or one-third that of the vessel's ordinary rudder aft. It was also evidently placed too far forward, and was not sufficiently immersed, the upper part of the rudder being some nine inches above the water line. In fitting a bow rudder to a man-of-war, Captain Warren proposes to have the upper part of the rudder 15 feet below the water line in a vessel drawing, like Her Majesty's ship Defence, 26 feet of water, and other ships in proportion. It is evident, therefore, that the principle, although certain favourable results were obtained, could not be fairly tested; that is—that with an increased area and submersion of the rudder, and an alteration of position, its power would have been more fully developed. Captain Broadhead, R.N., conducted the trials. Among the gentlemen on board to witness the trial were —Admiral Sir H. D. Chads, Captain Fullerton, R. N., Mr. A. Heather, manager of the United Steampacket Company; Mr. Reed, manager of Messrs. White's shipbuilding-yard and slipway, &c. The first trial was made by placing the after or ordinary rudder of the ship hard over, when the ship made a complete circle in 3 min. 22 sec., the engines making 27 revolutions. In the second trial the forward rudder was put hard over; but the vessel was so long in making the half-circle that this trial was abandoned. In the third trial the forward rudder was put hard over, and the after rudder fixed amidships with chocks, when a circle was completed to port in 6 min. 19 sec., the engines making 26½ revolutions. In the fourth, the forward rudder was again put hard over, but this time with the after rudder loose, when the time occupied in completing the circle, the steamer coming round in this instance also to port, was 8 min. 24 sec., the revolutions of the engines being 26½. In the next trial the after rudder was put hard over, with the forward rudder loose, and the ship made the circle to port in 3 minutes, the revolutions of the engines being 26. Both rudders were next put hard over together, when a circle was completed to port in 2 min, and 47 sec., a gain of 13 sec. on the preceding trial, the engines making 24 revolutions. When the ship stopped dead, the after rudder was put hard over and forward rudder fixed, when the engines were turned ahead, the time being taken from their moving fairly ahead. Circle computed in 3 min. 37 sec. The same experiment was next carried out with the forward rudder, when the circle to port was completed in 6 min. 40 sec., the revolutions of the engines being 25½. Forward rudders, like screws, require lengthened and expensive experiments to develope their powers, and are almost beyond the means of private individuals. There is, however, no doubt considerable merit attached to the plan proposed by Captain Warren, but the experiments require to be carried out on a larger and more perfect scale.

PARRY'S STEEL FURNACES.

FIG. 1. FIG. 2.



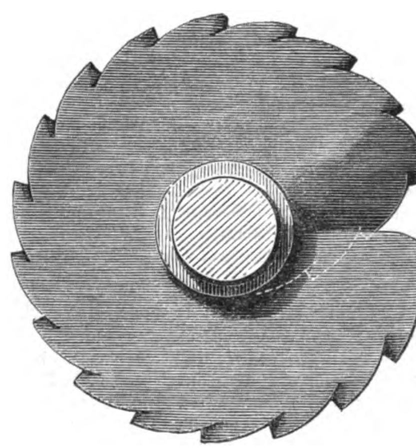
MR. G. PARRY, of the Ebbw Vale Iron Works, Monmouth, has patented an improvement in the manufacture of iron and steel. The above engravings show in sectional elevation a furnace or receiver for making hard or soft steel in large masses for casting purposes. The invention consists in blowing air through the fluid metal for the purpose of reducing it to any degree of softness.

E E are two blast boxes, of which there are several placed round the furnace. They are made either cylindrical to hold but one tuyere each, or are widened out around the furnace so as to hold a greater number. The main blast pipe is connected to the blast boxes by suitable pipes; there are two tuyeres for blowing air through the molten metal, and *H* the tap hole for discharging it when reduced to the required degree of softness. This furnace or receiver is made of a curved or parabolic form, as shown, and lined with fire-resisting material. The charge of hard steel or carburetted wrought iron is run in a molten state into the furnace through the opening at the top after the blast has been turned on.

The furnace may conveniently be heated by means of a gas blow pipe, as shown. *A* is the fuel chamber of this blow pipe, charged with breeze, or refuse from the fires, together with a portion of lime to flux the clinker and ash, and which runs out at the cinder hole; *B* is a blast pipe for generating the gas, and *H* another for effecting the combustion of the gases while passing through the pipe to the furnace; or the blast of air for consuming the gases may be introduced directly into the pipe. This gas furnace is lined with fire-brick and closed with a cover, or it may be surmounted by a charging hopper. The pipe is also lined with loam or other bad conductor of heat. This gas blow pipe is mounted on wheels for the convenience of removing it to and from the furnace when desired. After a few minutes blowing into the receiver (the exact time requisite being very accurately ascertained by the workman after a little experience) the steel will have become sufficiently softened, and may be tapped and run out into a funnel and dealt with as necessary. Previously to tapping, the furnace alloys may be run in at the top, or, what is better, the alloying material may be poured into the funnel as the steel is running. It may also be hardened when made too soft by the addition of hard steel or of any pure pig or carburetted iron (which may also contain the alloy) in the same manner.

In the manufacture of cast steel direct from crude pig iron, as lately introduced by removing a portion of the carbon, sulphur and phosphorus remain behind, and it is difficult to get crude pig iron free from these injurious elements. In this process for manufacturing cast steel by adding carbon to wrought iron (which had previously been puddled) nearly all the pig iron produced in this country becomes available for the manufacture of cast steel in this converting furnace, the greater proportion of the sulphur and phosphorus originally contained in the iron having previously been eliminated in the puddling process.

JOHNSON'S EARTH SCREWS.

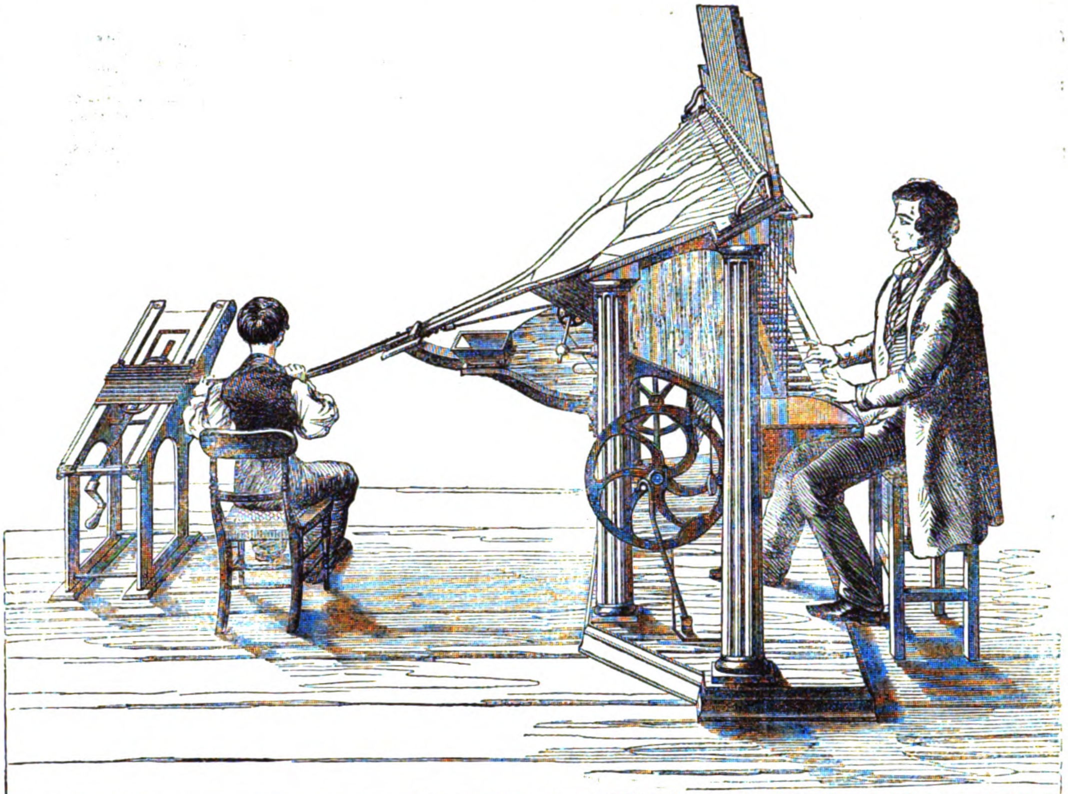


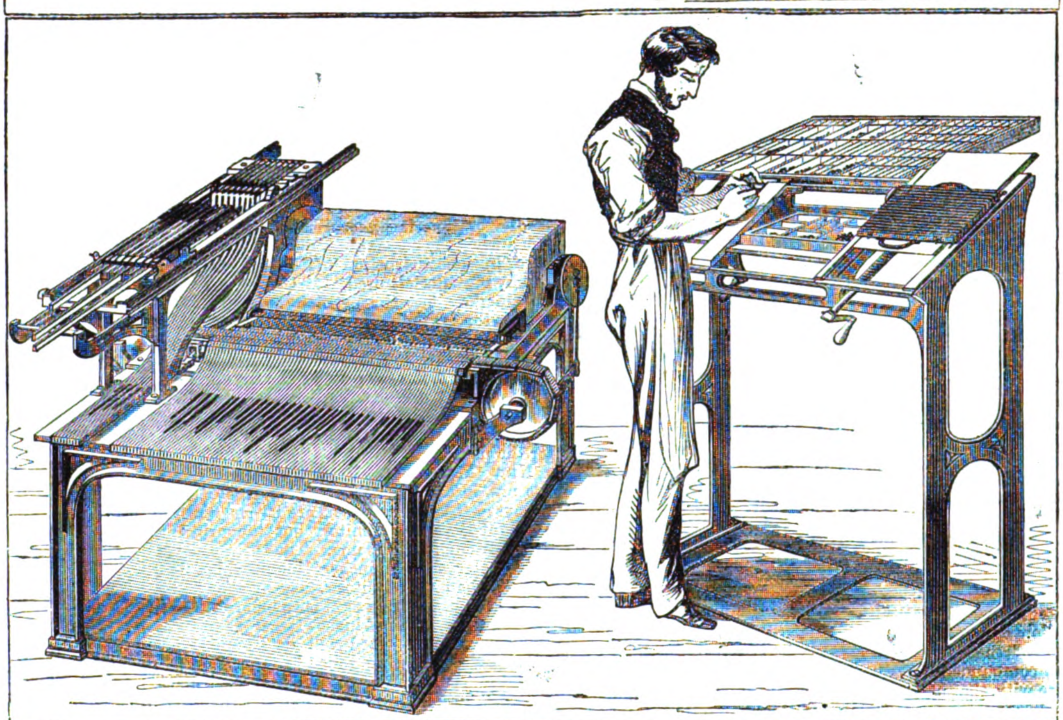
THE annexed engraving illustrates a screw suitable for pile and other foundations. The invention consists in making the periphery of the flange of the screw with a number of teeth similar to a circular saw, as shown, and arranged so as to assist the pitch of the screw, thereby enabling it to cut its way into the ground with greater facility than those at present used with a plain and unbroken flange, or the screws may be made by having only a portion of its periphery with teeth, and in this case a projection would be made at its cutting edge, so that the remainder of the screw, which is of a lesser diameter, would follow in the opening made by the said projection.

This invention is patented by Mr. F. Johnson, of North-street, Westminster.

The petition for the prolongation of Stirling's patent for the manufacture of iron for railway lines, was heard by the Judicial Committee of the Privy Council on Wednesday last, and dismissed.

YOUNG'S PATENT TYPE COMPOSING MACHINE.





THE inventor says that this type composing machine is provided with separate compartments called "reservoirs," for all the letters of a fount, and each reservoir is provided with a small lever, which, by means of a rod, is connected to a key like those used in a pianoforte. When a key is struck by the player it pushes a type out of the reservoir by means of the lever mentioned above, and the type is thus caused to slide down an inclined plane, and thence into a receiver, where it is set up side by side with other types, by means of a beater. Thus each type or letter can be set up by a player in the order required by a compositor's copy. This is now done with a speed of from 12,000 to 15,000 types set up in an hour's time.

The justifying apparatus is intended to replace the compositor's stick. The compositor places the galley filled with the long lines of type set up by the composing machine, slides one of them into the apparatus, divides it into the proper width of the page, and having justified it, moves a handle which depresses the completed line, and thus makes room for a succeeding one. It is found that a compositor can, by this means, justify at the rate of 4,000 to 6,000 types per hour.

The distributing machine separates all the different letters of a fount that may have been used for printing into different channels ready for use in the composing machine. This is effected by one or more pairs of nippers, which takes every type singly from the reservoir in which all the types have been placed, and allows it to slide down an inclined plane, the upper part of which moves on a hinge. The thin or lower-case types slide down to the bottom of the fixed inclined plane, but the thicker or upper-case letters are retained on the moveable incline, which, on being raised, drops them into an appropriate receptacle, whence they are then taken and re-distributed by passing down a separate channel of the inclined plane. The thin or lower-case letters that have arrived at the bottom of the inclined plane are pushed into the grooves of a revolving chain. This chain in moving passes underneath plates which are made of different widths in order to cover only certain nicks cut or cast on the edge of the types, and situated in different parts of their length, from 1-16th to 12-16ths of an inch from the tail of each type. When, therefore, a type passes underneath a plate which allows its nick to be exposed, it is pushed from off the chain by means of a scraper which passes over the plate on to a tilting inclined plane. This plane in its descent allows the type to slide down, by means of an inclined channel, into a receiver, where it is set up by means of a beater, as in the composing machine. The distinguishing nicks are somewhat like those used by type-founders; 71 per cent. of the types require only one nick, 20 per cent. only two nicks, and the remainder have three nicks. One distributing machine, attended by two boys, will distribute and prepare for the composing machine from 14,000 to 18,000 types per hour. A saving of 50 per cent. in the cost of composition is said to be effected by the use of these machines.

The machine may be seen at work daily in the International Exhibition, Class 7, and further information may be obtained at 77 Fleet-street.

A second edition of "The Fleet of the Future in 1862, or England without a Fleet," by J. Scott Russell, Esq., F. R. S., has just been published.

A novel trawling experiment will take place in a few days, by means of a steam fishing vessel, lately fitted up at Leith. Her trawling gear, which is very heavy, is intended to be wound up by a capstan driven by steam power, and all living fish thus taken will be put into a well, or salt-water aquarium, having a constant circulation of water through it; and thus the fish will be kept in existence until brought to market. We believe this to be the first direct application of the steam-engine to the purpose of catching fish, and the latter will soon have to contend against machine as well as hand labour. Whether they will "hold meetings and protest" against its introduction, remains to be found out.

TO CORRESPONDENTS.

Received.—T. W. B., T.F., W. E., M. and Son, J. and G., W. H. T. (two letters), D. M., R. E., J. H. H., J. N., J. W., W. A., W. F., R. A., J. B. B., W. W., D. M., W. E. M., G. S., R. K. P., J. H. E., J. H. J.

The letter of "Civilian" will appear next week, when the communications from several correspondents will be noticed.

Correspondence.

[*We do not hold ourselves responsible for the statements of our Correspondents.*]

PERCUSSIVE FORCE COMPARED WITH PRESSURE.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Sir,—Some years since an experiment was tried in Portsmouth dockyard, with a view to compare percussive force with pressure.

Through a block of sound oak was bored a hole one inch diameter; into the hole was inserted an iron bolt, which fitted very tightly. An able-bodied shipwright drove the bolt into the block by striking on the head of the bolt with a maul weighing 18 lbs., its length of handle being 45 inches. Every blow of the maul sent the bolt into the block about a quarter of an inch. When the bolt had been driven in some inches it was submitted to pressure, and it bore one hundred and five tons before it yielded; a few hundred weights beyond the one hundred and five tons set the bolt in motion and forced it close home.

Momentum, or percussive force, is not simply as the weight of the body multiplied by its velocity, but it is as the weight of the body multiplied by the *square* of its velocity. A cannon ball moving with a velocity of 2,000 feet per second, has four times the momentum of a cannon-ball of like form, and equal weight, moving with a velocity of 1,000 feet per second.

Falling bodies acquire accelerated motion by the force of gravity. At the end of the first second, a body so descending will have acquired a velocity of 32 feet per second (disregarding a small fraction); and as the velocities acquired are as the times of descent, and as the spaces passed through are as the squares of the times of descent, the space passed through being at the end of the first second 16 feet, we have $\frac{2000}{32} = 62{\cdot}5$ seconds time of descent to acquire a velocity of 2,000 feet; and $62{\cdot}5^2 . 16 = 62{,}500$ feet the space passed through in 62·5 seconds; a velocity of 1,000 feet would require the body to be dropped from a height of 15,625 feet. In each case the body is supposed to descend in vacuum; but in a body descending through the atmosphere, by force of gravity, such a velocity is not attainable.

John Harvey, Capt. R.N.

Cheltenham, June 18th, 1862.

THE STRAIGHT LINE *VERSUS* THE WAVE LINE FOR VESSELS.

Sir,—Permit me a few words only in reply to Mr. Moy. I have great respect for this gentleman, for the excellent good sense which his communications generally display; but I must be excused from complimenting him on his scientific acumen, at least, until he disproves and not simply denies my reputation, as I deem it to be, of the wave line theory for vessels. He says that "the curves used are *not* parabolic curves." I implied the same in part when I said that they gradually merge into straight lines as they approach the surface of the water (this is a concession to practice), but elsewhere in the hollow moulding of the bow they are employed, and I suppose with rigorous exactness, for the theory demands it, the theory of equal increments of velocity in equal times, but with decrements thereof as the hollow curves merge, by being softened off, into the lines of the side of the vessel. I suspect Mr. Moy has confounded the merging of the lines in the one case with that of the other. The real point of the matter is this: Is acceleration of any kind, uniform or otherwise, the object aimed at, or at any rate the effect produced by hollow lines, whatever may be their character? This leads me to remark that "the novelty of the idea" I am charged with claiming, is not in proposing straight lines for bows of vessels, but in proving that such lines present the minimum of resistance, and that hollow lines increase it. Mr. Moy must have overlooked what I said in regard to the tensile strain on my proposed vessel being met, "by having longitudinal strakes of iron on the interior surface," or he never would have made the remark that my "mode of ship-building could not possibly hold together." These strakes could, of course, be multiplied and increased in thickness to any amount of strength which the structure might require. But I pray him to have patience for awhile until the whole of my scheme, so far at least as it would be advisable to detail it, is before him, when he will find that the upper deck will supply, and at the right place too, the strength that he thinks is wanting. His defence, however, of the wave line theory will at any time be welcome, but I would remind him that in the comparative estimate made by me of the work done under each line, their common datum for calculation, (distance and angle being of course alike) was the point where the lines respectively begin to merge into the line of the ship's side, beyond which point, towards the midship section, the work done is nearly the same for each, and would be quite, only that there is a contrary flexure with the hollow line, which necessitates a greater convexity in the softening off than with the straight line.

Benjamin Cheverton.

Gossip.

William Templeton, Esq., the author of the "The Operative Mechanic's Workshop Companion," has just published a work entitled "The Engineer's, Millwright's, and Machinist's, Practical Assistant," being a collection of valuable tables, data, &c. Messrs. Lockwood, of Stationers' Hall Court, are the publishers.

An account of a new steam propeller, both curious and important, comes from Antwerp, describing the performance on the Scheldt on Tuesday of a newly invented steam craft propelled with perfect ease, and amenable to the most accurate guidance, while dispensing altogether with the comparatively cumbrous mechanism of either paddle wheel or screw. The motive power is simply a central pump forcing a continuous stream into two lateral tubes, the rapid backward gush from which propinges the barque, and is not liable to the entangling or disarrangement incidental to both the other systems of propulsion. The dockyard of MM. Cockerill has launched this specimen from a working model of Herr Seidel, and it is to ply forthwith on the Meuse, and between Liege and Seraign.

The terra-cotta pavements of the New Westminster Bridge, edged with Peterhead granite, and kerbed by cast-iron, are quite experimental, and we must plead guilty to some doubts as to their successful resistance of wear and tear. Time only will resolve them. The parapets of the structure are too low by a foot, and are unpleasantly suggestive of suicide, murder, and accident. This matter will have to be attended to beyond question, for although the view of the Houses of Parliament and the river is made more extensive and agreeable by the lowness of the parapet, yet the lives of Her Majesty's lieges must not be jeopardized to obtain it. A considerable amount of vibration is discernible at the crown of each arch during the passage of vehicles, and if there be an error in the construction of the bridge, it is in the economy of materials used.

On Wednesday last the petition of Mr. Alfred Vincent Newton for the prolongation of letters patent for certain improvements in dressing or cleaning grain, and in separating extraneous matters therefrom, was heard before the Judicial Committee of the Privy Council, and dismissed, with costs. Mr. Welsby appeared, on behalf of the Attorney-General, for the Crown; Mr. Grove, Q.C., and Mr. Macrory were for the petitioner.

The New Monitors.—Regarding the six new Monitors now in course of construction, the *Albany Courier* says:—"The new vessels are larger and far more powerful than the Monitor, but the principle of their construction is the same. The turrets are 21 feet in diameter and 11 inches thick—which is 3 inches thicker than the Monitor's. The armour plates are 6 inches thick. Each vessel is to be armed with two 15-inch guns, which is 4 inches larger than those of the Monitor. Their speed will be 10 miles per hour. The plates are being rolled in Maryland and Pennsylvania. All the rest of the iron for frames, fastenings, &c., amounting to several thousand tons, is being made by Corning, Winslow and Co., and the Rensselaer Iron Company, at their works in Troy. Four of the vessels are to be completed by the 1st of August, and two by the 1st of September. Some 2,800 men are at work upon these six vessels, and it is confidently believed by the contractors that they will have them completed within the stipulated time. If so, it will probably challenge the world for a parallel in mechanical achievement. An error exists in the popular mind as to the sea-going properties of these vessels—it being generally supposed that they are unsuited to outside service. It was demonstrated by the run of the Monitor from New York to Hampton Roads that she is as stanch and safe as the best modelled ship. The new vessels will be equally safe, and well adapted to service at sea."

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

The abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgment:—

Steam Engines, &c., 3120, 3123, 3126, 3173.

Boilers and their Furnaces, &c., *None.*

Roads and Vehicles, including railway plant and carriages, saddlery and harness, &c., 3133, 3149, 3157.

Ships and Boats, including their fittings, 3129, 3130, 3132, 3182, 3187, 3194.

Cultivation of the Soil, including agricultural and horticultural implements and machines, *None.*

Food and Beverages, including apparatus for preparing food for men and animals, 3118, 3127, 3139.

Fibrous Fabrics, including machinery for treating fibres, pulp, paper, &c., 3122, 3131, 3136, 3151, 3153, 3155, 3162, 3165, 3174, 3181, 3183, 3192, 3193.

Buildings and Building Materials, including sewers, drain-pipes, brick and tile machines, &c. *None.*

Lighting, Heating, and Ventilating, 3124.

Furniture and Apparel, including household utensils time-keepers, jewellery, musical instruments, &c., 3121, 3134, 3145, 3158, 3159, 3160, 3161, 3172, 3176, 3189.

Metals, including apparatus for their manufacture, 3142, 3150, 3186.

Chemistry and Photography, 3147.

Electrical Apparatus, 3170.

Warfare, 3119, 3154, 3166.

Letter-Press Printing, &c., *None.*

Miscellaneous, 3125, 3128, 3135, 3137, 3138, 3140, 3141, 3143, 3144, 3146, 3148, 3152, 3163, 3164, 3167, 3168, 3169, 3171, 3175, 3177, 3180, 3184, 3185, 3191.

3118. A. Tonnar. *An apparatus for the drying and cleansing of malt, as well as any other species of grain and seed intended for brewing, distilling, and agricultural purposes.* Dated Dec. 12, 1861.

This invention consists in a peculiar method of employing centrifugal force for the combined purposes of putting the grain in motion, and for dividing and separatig from it the waste, for the distribution of the heat, for clearing away the damp air, and for the ventilation and sifting of the malt. *Patent completed.*

3119. J. W. Scott. *Improvements in wads for fire-arms.* Dated Dec. 12, 1861.

This invention consists in the manufacture of a compound wad, or wad and valve of leather or other suitable material, the valve part of which will yield and allow of easy insertion and ramming home of the charge, but which upon the discharge of the arm will be expanded and forced into contact with the whole circumference of the bore, and not only offer the necessary resistance to the explosive gases, but at the same time cleanse the barrel. The most simple form of compound wad and valve, and that which the patentee prefers, consists of a cup of compressed butt leather of or about the same circumference as that of the bore of the arm in which it is to be used; the edges of this wad may be toothed or plain, and instead of its being in the form of a cup, it may be a plain disc, and of any suitable material. To this wad, and preferably at the centre only, he attaches by a rivet, pin, or stud, or by glue or cement, a leather valve, rather larger in circumference than the bore. This valve, when the compound wad is inserted in the barrel, is placed uppermost. He sometimes forms this compound wad by inserting in or fixing to the edge of the wad, whether cupped or not, a ring or annular valve of leather, cloth, or other suitable material. The invention also consists in forming wads of simple discs of leather or other suitable material with toothed edges. *Patent completed.*

3120. J. D. John. *Improvements in locomotive engines, parts of which improvements are also applicable to marine and stationary engines.* Dated Dec. 12, 1861.

This consists, 1, in a mode of transmitting motion from the pistons or piston rods of the steam cylinders to the driving wheels. For this purpose a self-acting lever clutch is adapted to the nave of the wheel, and when it is desired to transmit motion from the piston of the working cylinder to the driving wheel, this lever-clutch is made to bind on the axle and nave, and thereby attach them for the time being firmly together; but upon cutting off the steam from the working cylinders and thereby stopping the action of the pistons, the lever-clutch will be drawn back, and the driving wheel left free to move on the axle without the latter rotating, and keeping in motion the whole of the driving gear of the engine, as is now the case. The invention relates also to a mode of constructing the pistons of the working cylinders. The piston consists of a top and bottom disc or plate, the form of which may be permanently attached to the piston rod, and the other secured in its place by screw bolts or otherwise. Recesses are made in the inner surfaces of these plates or discs to receive coiled or convolute springs, like clock or watch-springs, which are made to act on the back of wedge-shaped pieces or blocks. Segmental packing pieces form the packing of the piston, and are kept thrust outwards by the wedge-shaped pieces, which, by bearing against the clock-springs behind, will give a considerable amount of elasticity to the packing. The top and bottom plates or discs of the pistons are secured together with the springs and segmental packing pieces between them by means of screw-bolts,

which may pass through the springs. The invention also consists in adapting to the backs of the slide-valves of steam-engines segmental or other suitably-formed packing pieces, which are kept up to the working face of the top plate of the valve by coiled or other springs. A convolute spring is also adapted to the lever of the safety-valve. *Patent completed.*

3121. H. BAILEY. ***An improved button or stud.*** Dated Dec. 12, 1861.

This consists in forming the button or stud in two parts similar to the two discs or the faces of ordinary studs, and in furnishing the interior surfaces of these discs with a male and female screw formed of metal, and fixed in the button or stud, so that by applying the two portions thereof, one each side of the garment, or other object to be secured, and by screwing them together through a small eyelet hole made therein, a perfect fastening will be obtained. *Patent abandoned.*

3122. R. ASHWORTH, G. SHEPHERD, J. CORMACK, and J. DEARDON. *Improvements in looms for weaving.* Dated Dec. 13, 1861.

This consists in dispensing with the roller known as the emery roller in front of the loom, and in bringing the cloth from the loom at any constant velocity agreeing with the number of picks, thereby making the cloth even and uniform in texture. *Patent abandoned.*

3123. S. B. HEWETT. *Improvements in the construction of boilers or generators for steam engines and other uses, applicable also to evaporators, and in pumps used therewith or otherwise used, some of which improvements in pumps are applicable to pistons and piston rods generally.* Dated Dec. 13, 1861.

This consists in the construction of boilers or steam generators with a number of cells, tubes, or boxes, so as mutually to afford strength to stay each other, and to give strength to the whole structure of the boiler, &c. The improvements in pumps comprise, among other features, the constructing of a piston in two parts, to the upper of which is connected a tube enclosing the ordinary piston rod, the piston rod being connected to the lower, both tube and rod being connected to a cross head at the top, so as to admit of the tube or rod being turned, and the parts of the piston respectively connected thereto being also turned, thereby moving the intermediate packing onwards, and tightening the packing of the piston; the under side of the upper plate of the piston is formed with bevilled teeth or edges, gearing into bevilled pinions or pauls, and ratchet wheels connected to screws and nuts, which act so as to expand the metallic or other packing. The invention also consists in a mode of tightening the packing; also in using a suction pipe, with a worm rose inserted in it to prevent choking; also in the adaptation and application of a two throw crank, with its connections, as described. *Patent completed.*

3124 W. BELL. *Improvements in kitcheners or cooking ranges.* Dated Dec. 13, 1861.

The patentee claims, 1, making the bottom grate in two parts, namely, of a frame to be built into the brick work, and a perforated plate or set of grate bars to be dropped or placed in the said fixed frame. 2. Making the false or contracting grate bottom with a projection at its back, so as to make it fit against the back of the fireplace, and prevent the fire falling at the back of the said false or contracting grate bottom into the ashpit or pan of the grate. 3. A ventilator consisting of an iron box situated at the back and on the top of the oven, and extending the whole or nearly the whole width of the oven, and communicating therewith by a series of openings, or one large opening. Lastly, the new latch for the oven doors of kitcheners constructed, as described. *Patent completed.*

3125. F. BRAMPTON.—*An improvement or improvements in the manufacture of the middle joints of measuring rules.* Dated Dec. 13, 1861.

In the middle joints of measuring rules, as ordinarily constructed, one side of the joint consists of a circular disc of brass, and a flap or plate of about one-half the thickness of the said disc. The whole of the said side is made from one piece of sheet metal of the thickness of the disc, the thickness of the side being reduced by turning or cutting away the metal at that part. This invention consists in making the said side of sheet metal of the thickness of the flap or plate, and making the disc in the following manner:—The blank is cut in the usual way, excepting that the disc part is a little larger than the finished disc is required to be. By means of raising tools the edge of the disc is raised into a plain at right angles to the other part, and there is thus formed a rim of a depth somewhat greater than the thickness required in the finished disc. A disc of zinc or iron is placed within the said rim, and fixed therein by closing tools. The side is finished in the ordinary way, and the joint made therewith has the appearance in the finished rule of a joint made wholly of brass. *Patent abandoned.*

3126. H. J. OLDING. *Improvements in the mode of, and apparatus for feeding steam boilers, also in apparatus for supplying fluids for other purposes, and in apparatus for raising fluids.* Dated Dec. 13, 1861.

The patentee claims, 1, the mode of arranging, combining, and applying apparatus for feeding steam boilers, according to which a chamber and pipes or passage are so arranged and combined with each other and the boiler, that the feed or supply of fluid to the boiler is self-acting, or self-regulating, as described. 2. The improved flat valve described, in so far as regards the arranging and combining of an annular float with stem and valve plate, as described. 3. The impinging plate-valve described, in so far as regards the combining of a valve plate with a plate of broader surface, as described. 4. The arranging and combining of the impinging plate-valve described with the spring, with angular bend or projection, as described. 5. The arrangement and combination of apparatus substantially in manner described, for feeding or supplying fluids to vessels other than steam boilers. 6. Arranging and combining apparatus for raising fluids substantially, as described. *Patent completed.*

3127. C. E. B. de BEAULIEU. *Improvements in the manufacture of spirituous liquors, and in apparatus employed therein.* Dated Dec. 13, 1861.

Here the object is the distribution of spirituous liquors, so as to prevent their receiving that empyreumatic flavour which always accompanies them when distilled in the usual way. The invention consists in distilling such spirituous liqours in a more or less perfect vacuum, by certain apparatus whereby the heat required for the volatilization of the alcohol from the fermented substance is reduced to so low a degree as to prevent the simultaneous volatilization of the empyreumatic oils, which are generally degenerated by the action of a greater heat upon the fermented matter. *Patent completed.*

3128. G. BIRD. ***An improved lubricating grease.*** Dated Dec. 13, 1861.

This consists in taking tar oil, or oil such as is obtained in the process of distilling tar, and first removing from it the more volatile parts by distillation. The heavy oil thus obtained may be used for lubricating, or there may be mixed with it a quantity of gelatinous matter, such as size, for the purpose of giving a body, and for a similar purpose cream of lime may also be used. *Patent abandoned.*

3129. J. W. FRIEND. *Improvements in apparatus for registering the depth and flow of liquids, and the distances run by ships at sea.* Dated Dec. 13, 1861.

This consists of a fan or paddle-wheel, mounted upon spindle bearings (within a suitable case), furnished with water-ways for conducting the fluid to the floats or paddles; in connection with revolving graduated wheel or dial-plates, through the intervention of tangent tooth and pinion gear, so arranged that, upon the fan or paddle-wheel being actuated by the passage of the water through the instrument, the graduated wheel or dial-plates will be caused to register results corresponding thereto for the purpose of indicating the depth of water at sea, the speed or distance run by ships or other vessels, or the amount of fluid otherwise passed through the apparatus, the apparatus when used as a log being curved and weighted, so as to maintain its proper position in the water, and is also provided with side wings for keeping the same constantly submerged. *Patent completed.*

3130. T. WALKER. *Improvements in means or apparatus for indicating the speed of vessels, and for taking soundings.* Dated Dec. 13, 1861.

For indicating the speed of vessels the patentee applies inclined or oblique vanes upon a tube which is capable of freely rotating upon a central spindle or axis, when acted upon by passing through the water. The fore end of the axis is provided with a protector, which he prefers to be of a conical form adapted to prevent the water pressing upon the end of the tube carrying the vanes, and thereby causing friction, which would impede the proper working of that tube by the action of the water on its oblique or inclined vanes. The wheel work for registering the rotation of the vanes is carried by a frame, which, like the protector, does not revolve, and is enclosed within the tube, or within the protector, or it is carried by some other part of the apparatus, which does not revolve. Motion is given to the registering wheelwork by a wheel attached to the tube of the rotators acting on a pinion, or by a stud on the tube of the rotators acting on the arms of a wheel affixed to a worm or pinion, giving motion to the first of the series of wheels, or by other means. A slide or other cover encloses the dials, which slide is capable of easy removal to see the distance run without removing the wheelwork. For taking soundings, the apparatus is similarly arranged, but with a weight to assist its descent, and the dials are formed to indicate fathoms and parts of fathoms, in place of miles and part of miles. *Patent completed.*

3131. T. B. GIBSON. *A new or improved ornamental fabric.* Dated Dec. 13, 1861.

This relates to the production of a new ornamental fabric, and consists in applying coloured designs, either by the aid of block or cylinder printing, to harness curtains, and other figured fabrics of that class. *Patent completed.*

3132. S. PADLEY. *Improvements in paddle-wheels.* Dated Dec. 13, 1861.

Here the floats are disposed in any suitable way independently around and between the concentric rims of the paddle-wheels, which are keyed fast on the paddle shaft in the usual way. Each float has an axis or shaft which passes through, and is free to vibrate in, the rims of the wheels; the axis of each of the floats is, on the exterior face of the inner rim of the wheels, formed as a crank, or has a half crank fixed thereon, the pin of which is received by and rotates in a corresponding hole or bush formed in the rim or periphery of a disc placed parallel with the wheels, but eccentric to the axis thereof, and capable of adjustment thereon, which eccentric movement is used in causing the floats to enter and leave the water, without the complication of mechanism involved in the various contrivances at present in use for producing the reefing or feathering motion in floats which have not a vibratory action, such as is due to their being mounted upon a horizontal shaft or axis according to the present invention. *Patent abandoned.*

3133. P. QUANTIN. *Manufacturing moulded earthen or stoneware cross sleepers for superseding wooden ones in the construction of railways.* Dated Dec. 13, 1861.

Here the patentee manufactures moulded earthen or stoneware cross sleepers, of any required shape or size, and moulded either hollow or solid, and to suit the various descriptions of rails which may be used. He supports the rails upon such cross sleepers either by the interposition of wooden or other bed pieces, or without their intervention, and they be keyed or fastened in any of the ordinary ways. Instead of using clay alone he mixes it and tempers it with any other suitable material, the better to adapt it to the purpose for which it is intended to be used. The cross sleepers of this invention can be made of various sizes and shapes to suit the rails of different descriptions; they are composed of two blocks of earthen or stoneware moulded to a uniform shape, which two blocks are united together by an iron rod of suitable strength. Thicknesses of felt, or any other compressible material, are inserted betwixt the blocks of earthenware and connecting iron rod or bar; the chairs are placed over the rod or bar, and the whole is bolted fast together to form cross sleepers ready to receive the rails. *Patent completed.*

3134. T. CABOURG. *Improvements in screwing leather for the manufacture of shoes, and for other purposes.* Dated Dec. 13, 1861.

The object here is the construction of a machine which will form a thread upon a continuous length of brass wire, and at the same time cause it to penetrate by screwing into any portion of leather, or such like material, so as to unite them in one. *Patent abandoned.*

3135. A. V. NEWTON. *An improved arrangement of fire-escape.* (A communication.) Dated Dec. 13, 1861.

This consists in the use of a flexible or chain ladder applied to a building so that it may be folded in a tilting box, and in case of fire be released in a moment either by an inmate of the dwelling or a person at the outside, and the ladder allowed to descend to the earth, and form a ready means of escape. Also in combining with the flexible or chain ladder an alarm, so arranged that it will be sounded simultaneously with the liberating of the ladder. *Patent completed.*

3136. J. HETHERINGTON, T. WEBB, and J. CRAIG. *Improvements in machinery or apparatus for spinning and doubling cotton and other fibrous materials.* Dated Dec. 13, 1861.

This relates, 1, to the spindles of spinning and doubling machines which have no top bearings, and consists in forming the top of the spindle as a screw, for the purpose of holding and conducting the thread to the flyer. As a matter of construction the patentees form the screw of a separate piece, and adapt it to the spindle. 2. The invention consists in the application of a flexible bush to the copping rail. 3. In the use of a tube fixed to the bolster rail for supporting the spindle, and which tube is traversed by the copping rail. 4. In a method of throwing the wheels of spinning and doubling spindles out of gear. *Patent completed.*

3137. H. APPLEBY and H. HARRISON. *Improvements in machinery for boring wood and other materials used for the manufacture of brooms and brushes.* Dated Dec. 13, 1861.

Here, in order that numerous holes may be simultaneously bored in a piece of wood, to receive tufts or bristles in the manufacture of brooms and brushes, a number of suitable drills or boring tools are employed, each mounted separately in a socket or holder on the end of a stem, which is so formed in parts connected by universal joints as to admit of a part of a stem being at an angle to the plane in which the drill or boring tool carried thereby works. At that end of the stem where the boring tool is applied a perforated plate is stationed, having in it a number of holes corresponding with the holes desired to be bored in the piece of wood, and in each of these holes there is a socket for a boring tool, and each socket has motion communicated to it by a stem constructed as above described. From this plate the stems diverge from one another and get further and further apart, and they pass through sockets which turn in holes in another plate. To the plate last mentioned a lever is applied, or other provision is made for moving it forward, together with the stems of the boring tools, so as to advance the boring tools into the wood held to the points of the boring tools. The back ends of the stems are supported in any suitable bearings, and each stem has on it a pulley or drum to receive a band or strap driven by a cylinder which is put in motion by a steam engine or other power. *Patent completed.*

3138. T. K. ADKINS, and J. BOUTHRON. *Improvements in the manufacture of starch, and in apparatus employed therein.* Dated Dec. 13, 1861.

Here the inventors take flour and make it into dough by kneading it with water; the dough is placed in a trough or vessel in which are surfaces having points or spikes upon them, and these surfaces, having a vibratory or other motion, continually perforate the dough. Streams of water run over the dough during this operation, and wash away the starch from it. The water with the starch escapes from the trough or vessel through holes covered with wire gauze or finely perforated metal; it runs into a vat where the starch is deposited. The supernatant water is run off, and the starch again mixed up with a small quantity of water, to which acetic acid is added; this mixture is allowed to ferment, a process which removes the impurities from the starch; a scum rises to the surface, and is skimmed off, when the purification is complete. The starch is made for sale in the usual way. *Patent abandoned.*

3139. J. KELLY. *Improvements in the treatment of milk for the manufacture of butter, and in apparatus for the same.* Dated Dec. 13, 1861.

This relates to making butter by a dairy range. The milk is preserved in milk vessels of glass from the time it is taken from the cows till the butter is made. The process of churning (in the lever churn, which is to be in connection with the dairy range) will occupy only a few minutes. *Patent abandoned.*

3140. R. A. BROOMAN. *Improvements in, and apparatus for, the production and application of motive power.* (A communication.) Dated Dec. 13, 1861.

This invention is based upon what the inventor terms the spontaneous transformation of a liquid into an elastic fluid, or, in other words, into dry steam at the moment of generation, which he terms spheroidal steam. The invention consists, 1, in the employment of a steam chamber floating in or on a metallic bath, serving in case of need for regulating the supply by the quantity of non-vapourized liquid it is capable of containing. 2. In the employment of a metallic bath of tin, lead, or other fusible metals, at the bottom of a generator for causing the spheroidal vapourization in the floating chamber; the bath renders the bottom of the generator inoxidizable, and prevents it becoming perforated or pierced, a result often produced by the sudden and incessant effects of expansion and contraction. 3. In the general arrangement of the feeding apparatus. 4. In the construction and arrangement of a pyrometric whistle. 5. In the construction of heat indicators for showing the temperature in the generators and condenser,

and for registering and indicating the draught in the chimney. 6. In the construction of a tubular supply generator. 7. In the construction of a tubular condenser. *Patent completed.*

3141. R. A. Brooman. *Improvements in blowers or apparatuses for superheating steam and other gases, and for projecting them combined with atmospheric air upon ignited combustible matter.* (A communication.) Dated Dec. 13, 1861.

This invention relates to the generation and employment of dry and superheated steam at a temperature of about 390° Fahr., or of a gas, fixed or not, the pressure of which shall be equal to what may be necessary for the particular application for which it is to be used. This steam or gas is caused to escape from an orifice, by virtue of its compression, into another orifice, calculated according to the quantity of air required in a given time. The mixture of steam, or gas, and air, is projected upon ignited combustible matter. There is then produced the phenomenon of double decomposition, the air yields its oxygen to the combustible matter to assist its combustion, and the steam already divided will become decomposed into oxygen and hydrogen, so as to produce the highest combustion. The apparatus invented for carrying the invention into effect is not described apart from the drawings. *Patent completed.*

3142. E. C. B. de Beaullieu. *Improvements in apparatus for extracting gold dust from auriferous sands.* Dated Dec. 14, 1861.

The patentee claims, 1, the arrangement by which the peculiar duplex vibrating motion is imparted to cylindrical sieves, as described with reference to the drawings. 2. The construction of apparatus for separating the gold dust from auriferous sands, in which the sand is caused to pass slowly along on the surface of a bed of mercury, to which a rapid vibrating or undulating motion is imparted, which motion being communicated to the sand causes the gold dust contained in the same to be separated from it by reason of it greater specific gravity, and to be precipitated into the bed of mercury, substantially as described. *Patent completed.*

3143. J. E. Duyck. *Improvements in the expression of oil from cake and seeds, and in apparatus employed therein.* Dated Dec. 14, 1861.

This invention consists in constructing plates or frames, which are to be fixed to leather or other suitable holders, of a series of transverse strips or bars bolted or rivetted on one side to the leather. These strips are united to two longitudinal tapering side plates, formed so as to admit the edges of the holder between the two thicknesses of the plates, and with channels open or closed beyond the distance to which the edges of the holder extend; there is also space between the leather and the side plates for the oil to run through and enter the channels. The patentee also employs between every pair of plates fixed to holders as aforesaid a naked plate, that is to say, a plate formed with transverse bars, and with conical channelled sides, as before described. The invention also consists in forming grooves or channels in the sides of the box or press, in which the material is placed to receive its pressure. He then places against the grooved sides a perforated plate, one on each side, the perforations in which communicate with or lead into the grooves, and thus escape is provided at the sides of the box or press for the outlet of such oil as may be expressed. *Patent completed.*

3144. F. Kohn. *An improved mode of copying writings, drawings, prints, and similar objects.* Dated Dec. 14, 1861.

This consists in passing an electric current through a great number of sheets of paper, or other suitable material, piled one upon another, and impregnated with substances capable of producing a coloured stain on the paper at any place where the electric current passes through the same. A substance of this kind is nitrate of silver dissolved in distilled water. *Patent abandoned.*

3145. C. McDougall and Joseph Crane. *Improvements in raising and supporting ladies' dresses.* Dated Dec. 14, 1861.

This consists in attaching to the ordinary clasps, hooks, or holders, a cord or band, and passing it through rings, eyes, swivels, or pulleys fixed and suspended to the belt which encircles the waist. The ends of the aforesaid cord or band are provided with knobs or tassels, which rest against the belt when the bottom of the dress is in its lowest position; but when the dress is required to be raised, the knobs or tassels are pulled so as to draw up or tighten the cord or band and raise the holders, and with them the bottom of the dress. *Patent abandoned.*

3146. W. R. Rogers. *An improved mode of constructing dovetail joints.* Dated Dec. 14, 1861.

The patentee claims inserting in the grooves of adjacent or contact surfaces metal or other keys for locking the parts together, as described. *Patent completed.*

3147. W. C. Debenham. *An improved plate holder for photographic purposes.* Dated Dec. 14, 1861.

This invention is not described apart from the drawings. *Patent abandoned.*

3148. W. Husband. *An improved water safety valve.* Dated Dec. 14, 1861.

This invention is not described apart from the drawings. *Patent completed.*

3149. J. H. Johnson. *Improvements in railway rolling stock.* (A communication.) Dated Dec. 14, 1861.

By this invention the passage of railway rolling stock round curves is facilitated, and the wear and tear of the rails and wheel tyres greatly reduced. It is proposed to fit one of the wheels upon the axle, so as to admit of its rotating freely thereon, the opposite wheel being fast in the axle. *Patent abandoned.*

3150. E. Cajoz. *Improvements in the treatment of pyrites for the manufacture of iron.* Dated Dec. 14, 1861.

Here the patentee mixes the residues of pyrites with other matters adapted to their proper fusion. The matters he uses are argillaceous earths, pulverized limestone or chalk, and he employs them conjointly or separately, according as their ascertained qualities are found favourable to the proper fusion of the pyritous residuum. *Patent completed.*

3151. J. Willis. *Improvements in the preparation of materials applicable to the manufacture of paper.* Dated Dec. 16, 1861.

This consists in the preparation of oatmeal seeds and sawdust, so as to adapt them for use as ingredients in the manufacture of paper, either separately or in combination. *Patent completed.*

3152. G. P. Vallas. *Improvements upon or additions to certain description of baths, with the object of rendering them available for use as trunks or boxes.* Dated Dec. 16, 1861.

This consists in adapting to hip and sitz baths; a removable lid or cover, and to such baths as have a rim or foot continued below the actual bottom of the bath, a fixed or removable bottom, whereby each description of bath may be used as a trunk or box. *Patent completed.*

3153. G. Davies. *Improvements in the manufacture of textile materials.* (A communication.) Dated Dec. 16, 1861.

This consists, 1, in the use for the manufacture of textile fibres of certain parts of the leaves and stalks of the plant known as Indian corn or maize. 2. In a process whereby the fibrous portions of such plant are reduced to a state in which they may be prepared, spun, and woven by the machines and processes ordinarily used for preparing, spinning, and weaving flax, hemp, &c. This process consists mainly in boiling the leaves and stalks in separate and suitable steam boilers or vessels. Sometimes it is necessary to add to the water a little lime or solution of soda. *Patent completed.*

3154. W. Bartram, and W. S. Harwood. *An improved apparatus for filling and ramming cartridges for breech-loading and other fire arms.* Dated Dec. 16, 1861.

This consists of a cylindrical tube of sufficient bore to receive the cartridge case, which is inserted at the lower end of the tube, the upper end of which is furnished with a cap screwed thereon, through which a cylindrical rammer is worked by hand or otherwise. The cylinder and rammer being in a vertical position, and the cartridge case having been inserted, the gunpowder is poured into the cylindrical rammer, which is funnel mouthed at the top, and forms both a rammer and feeder; the powder falls into the cartridge case, and a wad is then inserted through a slot in the cylinder above the cartridge case. The wad falls on to the powder in the case, and the rammer is then brought to bear upon the wad, so as to firmly fix it in its place on the top of the powder. The same process is then to be repeated with the shot. A spiral spring round the exterior of the rammer (to which one end of it is attached) serves to raise the rammer to its first position. The cylinder is furnished with a small slot or opening at its lowest part, so as to allow the wire in cartridges for breech-loading guns to pass through the cylinder, and still allow it to stand flat on the table or bench on which it is operated. *Patent completed.*

3155. D. Chalmers. *Improvements in looms for weaving, and in the manufacture of cloth therefrom.* Dated Dec. 14, 1861.

This invention is not described apart from the drawings. *Patent completed.*

3156. J. Aitken. *Improvements in supplying water to water-wheels.* Dated Dec. 16, 1861.

Here the patentee introduces a syphon between the wheel and the head or source of supply, so that the water from the head rises up the shorter leg of the syphon to the wheel. The water may be pumped or otherwise returned to the head or source of supply, where the shorter leg of the syphon is situated. *Patent completed.*

3157. W. G. Laws. *Improvements in railway point signals.* Dated Dec. 16, 1861.

This invention is not described apart from the drawings. *Patent completed.*

3158. C. Baumann. *Improvements in buttons.* Dated Dec. 16, 1861.

Here the button is so made that it may be attached to the fabric by a screw passing through the fabric from the back, and entering the stem of the button. The stem of the button is bored and tapped to receive the screw; there is a head formed on the screw, and a disc on the lower end of the stem of the button, and between these, when the button is fixed, the fabric is nipped. *Patent completed.*

3159. W. H. Tucker. *Improvements in locks.* Dated Dec. 17, 1861.

The specification of this invention is very voluminous, and cannot be quoted here at sufficient length for an intelligible abstract. *Patent completed.*

3160. J. W. Chalfont and D. Keys. *Improvements in winding up fusee watches and pocket chronometers, and setting their hands without keys.* Dated Dec. 17, 1861.

At the top or bottom of the axis of the fusee the inventors fix a wheel, into which acts another; attached to a ratchet runs a wheel in gear with a contrate wheel, the arbour of which goes through the pendant that may be turned by a small knob, which is also in action with a click spring; this spring is fastened in a box that is detained by another spring, so that when the wheel in action with the click is turned, it brings the click in action with the ratchet, and thereby the watch is wound up. When the detaining spring is pushed away by a piece projecting from the side of the case, it leaves the click free of the ratchet, at the same time taking an intermediate wheel into gear with the minute wheel, thereby enabling the hands to be set either way. *Patent abandoned.*

3161. J. B. Bunney and L. Wright. *Improvements in ornamenting metallic and non-metallic bedsteads and other articles made principally of metallic rods or tubes.* Dated Dec. 17, 1861.

This consists in casting on, or in casting and afterwards fixing on, the parts to be ornamented, ornaments of zinc, or other hard and cheap metal or metallic alloy, and afterwards coating the said ornaments with brass or silver, or painting, gilding, or japanning the said ornaments. The inventors effect the metallic coating by electro deposition. *Patent abandoned.*

3162. R. Shaw. *Certain improvements in carding engines.* Dated Dec. 17, 1861.

This consists in the use of an endless band or web of open wire work, lattice or woven fabric continuously traversing beneath the carding cylinders, and used as a creeper for conveying any loose cotton or other fibrous material falling from the cylinders whilst being carded back again to the "licker in." *Patent completed.*

3163. J. Dale. *Improvements in the manufacture of glue or size.* Dated Dec. 17, 1861.

Here the patentee takes tanners' refuse called "fleshings," and adds thereto muriatic acid; he then washes them, afterwards neutralizes any remaining acid, boils to separate the fatty matters, and obtains glue or size in the ordinary way. *Patent completed.*

3164. A. V. Newton. *Improved hoisting apparatus.* (A communication.) Dated Dec. 17, 1861.

This consists in the use of two pulleys of different diameters, and an endless chain, band, or rope applied to the pulleys, and arranged substantially as described, whereby the desired end is attained. The invention is not described apart from the drawings. *Patent completed.*

3165. J. Platt and W. Richardson. *Improvements in machinery or apparatus commonly called "gins" for cleaning cotton from seeds.* Dated Dec. 17, 1861.

This relates, 1, to apparatus which acts as a transferring comb for conveying the materials to the rollers in a prepared condition after the manner described in the specification of a patent granted to the present patentee on the 5th June, 1861 (No. 1439), and also to other apparatus used for agitating the material, or pushing it forward towards the rollers, and consists in so forming such apparatus that it shall yield to any undue resistance. Thus, if a connecting rod be employed, they cause it to act through the agency of springs, which may be caused to collapse by such resistance as aforesaid. 2. The invention consists in the adaptation of weights to the rollers of roller gins, for causing the one to bear against the other. *Patent completed.*

3166. R. Scott. *An improved method of rifling or grooving the barrels of fire-arms and ordnance.* Dated Dec. 18, 1861.

This consists in cutting the longitudinal spiral grooves along the interior surface of the barrels of rifles and ordnance, so as to present the smoothest possible surface to the projectile, in order to approximate as closely as practical to the cylindrical smooth bore; but at the same time giving sufficient from the cylindrical form to insure the projectile following the curved rim of the grooves without stripping. The patentee effects this object by giving to the grooves the cross sectional form of an arc of a circle, the radius of the arc being rather less than that of the interior surface of the barrel previous to grooving; the grooves when cut occupy the whole of the interior surface of the barrel, and the sides of the grooves intersect each other as they meet the interior cylindrical surface of the barrel. These points of intersection thus form raised angular bands running spirally down the barrel, and are the only lines of the interior surface of the barrel not cut away in the process of rifling. *Patent completed.*

3167. S. Sheppard. *A new or improved tap or stop-cock.* Dated Dec. 18, 1861.

This invention is not described apart from the drawings. *Patent completed.*

3168. J. Perrin. *An improved equilibrium valve.* Dated Dec. 18, 1861.

This relates to that description of valve used for diminishing the pressure of steam from high to low, or when used as a throttle-valve for regulating the supply to the cylinder. The inventor fixes two valves of the same diameter upon one spindle, and also a piston equal to one square inch of area, and causes the top of the spindle to be weighted with weights, each weight indicating 1lb. pressure of steam. The piston works in a cylinder, and is acted upon by the steam, so as to balance the weights according to the pressure, and as the valves are of equal diameters this arrangement is perfectly equilibrium. The valves are webbed and work through holes, and are bevilled to allow the steam to pass freely, and thereby prevent the shocks from sudden changes of pressure which generally occur with the ordinary flat valve. *Patent abandoned.*

3169. M. Cartwright. *Improvements in the manufacture of bels or palates for the reception of artificial teeth.* Dated Dec. 18, 1861.

This consists in a method of manufacturing models used in preparing plates or pieces for artificial teeth of vulcanite, ebonite, or hardened rubber, alone, or combined with soft vulcanized rubber. Also, in combining or amalgamating india rubber and gutta percha with metals, for the manufacture of artificial teeth or pieces, and for other purposes. *Patent abandoned.*

3170. W. Dicey. *Improvements in submarine electric telegraph cables.* Dated Dec. 18, 1861.

This refers to the covering or protecting of the core, and consists in effecting, or constructing the covering by ribbons or strips of metal applied or laid upon the core in a longitudinal direction, not perfectly in line therewith, but with a small amount of uniformly spiral twist around the core, and with an edge of each ribbon or strip overlapping one edge of the next or adjoining ribbon or strip. *Patent abandoned.*

3171. A. Petersen. *An improved system of drainage and irrigation for meadow and other land.* Dated Dec. 18, 1861.

Here from the head or top of the meadow the main drain is laid in the direction towards the lowest part of the meadow, at a distance of four to five feet from the surface. From this main drain side drains branch off at right angles with the main drain; and where required, these side drains have again their branches. These side drains are laid with a slight fall towards the main drain. At each place where a side drain enters into the main drain a shaft or pit is formed, reaching from about eighteen inches above the surface of the ground to the bottom of the main drain, and into the sides of which shaft the mouths of both the main drain and the side drains open. On the side towards the

off-flow, the main drain is fitted with a valve or sluice, which can be shut or operated as the case may require. By means of these sluices the water can be discharged or admitted and retained in any of the side drains, and the water raised to and kept at any desirable level between the bed of the closed sluice or main drain and the surface of the ground. Shallow regulating ditches are formed on the surface of the ground immediately over the side drains, which can be filled and made to run over the surface of the meadow, or in which the surplus surface water may collect and discharge itself into the shafts, which are for this purpose provided with openings or grates at the sides above the surface of the ground. *Patent abandoned.*

3172. M. HAUFF. *Improvements in the manufacture of boxes and cases.* Dated Dec. 18, 1861.

This relates to the manufacture of boxes and cases of what is termed leather cloth, and of that kind used in the manufacture of cap peaks in combination with mountings or framings of metal, gutta-percha, &c. The inventor forms the body, bottom, and top of the cloth material, and connects the bottom to the body by a metal or other ring or mounting. The bottom drops into the mounting, and rests on an internal flange, while the body of the box is tightly inserted above it, and held and fixed by the vertical part of the mounting. The upper end of the body may be stiffened by a binding or lip of metal or other material. The top or cover is furnished with a mounting similar to the bottom one in which the cloth material is held, the mounting being fitted to the lip or upper part of the body to slip on and off with the hold and facility required. *Patent abandoned.*

3173. J. RIDDINGTON. *Improved condensing apparatus or steam-engines.* (A communication.) Dated Dec. 18, 1861.

This is designed to dispense with the cold-water pump commonly used in condensing engines, and to produce purer water for feeding the boiler by condensing apparatus of the following construction :—The patentee uses a hollow cylinder, to the lower end of which a tube is fixed, and its other end connected to an air-pump. Beneath the piston thereof, within the aforesaid hollow vessel, are fixed two other vessels of smaller diameter ; the lower end of one vessel communicates by an outlet pipe fitted with a cock, with a well or other water supply, and the upper end of this vessel communicates with a perforated hollow chamber formed around the upper part of the second vessel, the lower end whereof extends to the feed-pump of the boiler beneath the piston thereof. The upper end of the hollow cylinder aforesaid is fitted with a dome-shape cover, to the top of which a bent pipe is fixed, the said pipe being used to conduct the steam from the cylinder of the engine into the condenser, the condensed water passing into a reservoir by a cock fitted in a branch of the said bent pipe. The effect is as follows :—The air-pump being put in motion forms a vacuum in the condenser, and causes water to enter therein, and pass through the perforations in the vessel therein, and coming into contact with the steam from the cylinder of the engine will condense the same. *Patent completed.*

3174. J. THIEBAUT. *Improvements in the ornamentation of textile fabrics.* Dated Dec. 18, 1861.

This refers to the ornamentation of textile fabrics such as muslin, net, silk, velvet, cloth, &c., and consists in printing or producing thereon ornamental designs, or devices by the granulated mineral or sparkling metallic substance known as steel dust. *Patent abandoned.*

3175. C. E. SYMONDS. *Improvements in the treatment and application to various useful purposes of certain organic compounds.* Dated Dec. 18, 1861.

This consists in the treatment and application to any useful purposes of any light spirituous liquid that distils over at a temperature of under the boiling point of water, having a specific gravity not exceeding 0·850, obtained from coal, peat, bitumen, bituminous schists, and other bituminous substances, petroleum, rangoon, tar, crude paraffine oils, rock or earth oils, &c. The patentee prefers to purify this light spirit having the aforesaid properties. *Patent abandoned.*

3176. E. PACE. *An improved lath for Venetian blinds.* Dated Dec. 18, 1861.

This consists in forming each separate lath of two leaves of wood (produced by a wood-slicing machine) glued or cemented together. By these means warping is prevented, after planing is avoided, and saving in wood is effected. *Patent abandoned.*

3177. J. M. H. A. TAURINES. *Improved mode of constructing balances, weighbridges, and other weighing machines.* Dated Dec. 18, 1861.

This invention is not described apart from the drawings. *Patent completed.*

3178. J. BANNEHR. *Improvements in apparatus for desiccating seeds, grain, and other articles.* Dated Dec. 18, 1861.

Here the patentee provides a cylinder, which he places horizontally, and which is furnished with longitudinal ledges or shelves in the interior, and such cylinder he causes to rotate round a hollow shaft passing through the entire length of the cylinder, this shaft is perforated, but stopped or plugged in the interior towards its outlet end. In connection with the hollow shaft he applies a fan or fans, or other apparatus to cause a current of air (either at its natural temperature or heated) to pass into and through such hollow shaft, and to be discharged through the perforations in numerous streams, to impinge on and take up the moisture from such matter as may be placed within the cylinder. The moistened air passes out either into and through a condenser, or into a chimney shaft. He provides the cylinder with suitable openings for loading and unloading, and he either closes up one or both ends of such cylinder, or not, providing, however, for the escape of moistened air. *Patent completed.*

3179. C. PONTIFEX. *Improvements in refrigerators for cooling worts and other liquors.* Dated Dec. 18, 1861.

This consists in an arrangement of refrigerators, having a number of pipes laid side by side, and over each other, in each of the troughs or channels, through which the wort or other liquor travels. The ends of each set of pipes in each trough are fixed into a metal box, so arranged that, by removing a cover on the box, the inside of the box may be easily got at to be cleaned or repaired, and any one or more of the pipes can thus be readily removed or exchanged if desired. The cooling liquid, or the liquor to be cooled, as the case may be, gets thoroughly mixed in these boxes after passing out of one set of pipes, and before entering another. This arrangement may, however, be modified. Another part of the invention consists in bringing the cold liquor into more active contact with the pipes containing the wort or other liquor to be cooled, when the apparatus is thus arranged to act. For this purpose the patentee prefers to construct the hinge used for lifting the frame with slots in the plates forming one portion of the hinge, and in the side of the refrigerator back he places rollers so arranged that the frame carrying the pipes is free to move sideways on these rollers to any extent desired. He actuates this frame by connecting rods working from eccentrics or cranks, which he prefers to place on the shaft that carries the drum employed to lift the frame when out of use. *Patent completed.*

3180. W BETTS. *Improvements in the manufacture of coverings for the ends of cigars.* Dated Dec. 19, 1861.

Here it is proposed to manufacture these coverings in a stamping machine, constructed on the principle of the bottle capsule machines, but with such modifications that great rapidity of manufacture may be combined with little or no waste of material, so that the cost of manufacture may be reduced to a minimum. The coverings are stamped out of discs of soft metal, which may be perforated in the centre before being introduced to the punches and dies, or perforated during the process of stamping. *Patent completed.*

3181. T. BOURNE. *Improvements in cotton gins.* (A communication.) Dated Dec. 19, 1861.

This is designed to clean all varieties of cotton by separating the seed from the fibre without breaking the seed or injury to the staple. The patentee uses a roller in combination with an adjustable stripping plate, an adjustable breast-plate, a screen or grating formed of rods, a chute, a feed-board, a stationary brush, and cams and springs. *Patent completed.*

3182. W. TATE. *Improvements in armour, and in making and applying the same, for protecting wood and iron ships of war and batteries.* Dated Dec. 19, 1861.

This consists in the use of, and improvements in the manufacture and mode of applying iron and steel wire (galvanized or ungalvanized) rope, stranded belts (of small and of large sized wires), round or flat, applied singly in belts of iron or steel, or intermixed as one belt, being by preference one-third steel and two-thirds iron wire, as armour for wood and iron ships of war and batteries, in place of iron plates, or in conjunction with iron plates. The iron and steel flat belts should be manufactured to suit the full length of the ship or batteries, from, for instance, 50 feet up to 600 feet, if required, and from 4 inches to 30 inches broad, and from half an inch to two inches in thickness (more or less). These belts should be laid on in tiers, as may be required, and when the proper strength has been obtained, then planked over with 3-inch teak planking, and if required, bolted through all, and then covered neatly (over all) with half-inch steel plates, 24 inches broad. *Patent completed.*

3183. E. STOTT. *Improvements used in apparatus for collecting and removing the waste and dirt which occurs in the process of spinning cotton and other fibrous materials.* Dated Dec. 19, 1861.

The first of these improvements consists in constructing and arranging the brackets so that the scavenger roller can yield and give way when any extraordinary pressure is opposed to it, and so prevent damage and breakage of the machinery. 2. In the application of mechanism by which the brackets (and consequently the scavenger roller) are raised so as to be entirely clear of the carriage boards during the running in of the carriages ; but on the carriage drawing out, the scavenger roller falls on to the carriage boards, and collects and removes the waste and the dirt as the carriage recedes from the roller beam. The third improvement relates to the application of certain mechanism, by which the scavenger roller not only cleanses the carriage boards from waste and dirt, but also cleanses the waste and dirt from the stands and front of the roller beam. *Patent completed.*

3184. J. H. G. WELLS. *Improvements in pumping elastic fluids.* Dated Dec. 19, 1861.

This invention is not described apart from the drawings. *Patent completed.*

3185. A. TRENILLE and F. X. TRAXLER. *A safety paper intended to prevent any forgery and fabrication of shares, bank notes, cheques, bills of exchange, stamped paper, postage stamps, &c., and preventing, likewise, all alterations and falsifications of public and private writs ; the same process being also applicable to the manufacturing of playing cards and other cards, or tickets made use of by railway companies and other administrations, public or private.* (A communication.) Dated Dec. 19, 1861.

This paper consists of a single sheet formed of several layers of pulp superposed of different nature and lines, according to requirements, and it may be made as resisting and strong as required for the various purposes. *Patent completed.*

PROVISIONAL PROTECTIONS.

Dated April 17, 1862.

1131. H. Gallagher, Bermondsey, manufacturer. Improvements in overalls, leggings, or in overboots.

Dated May 5, 1862.

1329. T. Wilson, Birmingham, engineer and gun manufacturer. Improvements in the manufacture of armour plates for ships of war and batteries, and in fastening or securing armour plates to ships of war and batteries.

Dated May 26, 1862.

1572. W. Clark, 53 Chancery-lane, engineer. Improvements in the manufacture of buttons, and in the mode of fastening the same. (A communication.)

Dated May 27, 1862.

1595. C. H. Hudson, merchant, Roxbury, U.S. Improvements in defensive armour.

Dated May 29, 1862.

1611. J. Hirst, jun., Dobcross, Saddleworth, and J. Wood, Birkby, Huddersfield. Improvements in stereoscopic apparatus.

1615. J. D. Lee and J. Crabtree, Shipley, near Bradford, machine makers. Improvements in looms for weaving.

1617. C. D. Abel, 20 Southampton-buildings, Chancery-lane. Improvements in apparatus for raising, propelling, or exhausting air, water, or other fluids, or gases. (A communication.)

1619. J. Paterson, Wood-street, warehouseman. An improved hemmer or instrument for turning over the edges of a binding or strip of linen or other material and preparing it for stitching in sewing machines.

1620. W. Clark, 53 Chancery-lane, engineer. An improved method of throwing the shuttles of looms. (A communication.)

1621. N. Lawton, machine maker, and R. P. Whitworth, foreman, Stalybridge, Chester. Improvements in engines for carding cotton and other fibrous materials.

Dated May 30, 1862.

1623. W. Footman, 5 Great Queen-street, Westminster. Improvements in the treatment and use of sewage and liquid manures, and in reservoirs and pipes to be used therein.

1627. R. Nicholson, Copt Hewick, Ripon, machine maker. Improvements in the construction of lawn mowing machines.

1629. J. Morrison, Birmingham, engineer and machinist. Improvements in the construction of springs, suitable for ladies' dresses or crinolines, and for chair, so a, and other seatings, as well as for bedstead and couch sackings.

1631. H. P. Burt, Charlotte-row, Mansion-house. Improvements in protecting wooden posts from decay, more particularly applicable to posts for supporting electric telegraph wires.

1633. T. N. Pengelly and W. Byron, Charlotte-street, Whitechapel, engineers. Improvements in apparatus for hoisting goods.

1635. R. E. Lofft, Troston, Bury St. Edmunds, gentleman. Improvements in small fire-arms and cartridges.

Dated May 31, 1862.

1637. A. Gilbey, Oxford-street, London, wine merchant. Improvements in the construction of packing cases or boxes for holding bottles either full or empty.

1639. G. Ermen, thread manufacturer, and R. Smith, machinist, Manchester. Certain improvements in machinery for spooling and balling sewing threads, silk, yarn, and other like fibrous materials.

1643. R. Shortrede, Brighton, major general in Her Majesty's Indian army. Improvements in presses for pressing cotton and other articles.

1645. H. Watson, Newcastle-upon-Tyne, engineer, and J. Millbourn, Dartford, paper manufacturer. Improvements in pulp strainers or knotter bottoms.

1649. G. C. Lingham and J. Nicklin, button manufacturers, stampers, and piercers, Birmingham. An improved crinoline connector and suspender.

Dated June 2, 1862.

1655. J. King, Moss Mill, Rochdale, cotton spinner, and J. Partington, overlooker. Certain improvements in looms for weaving.

1657. A. J. Sax, Paris, musical instrument maker. Improvements in kettle, big, or other drums.

1658. T. Cambell, Leeds, machinist. Improvements in apparatus for "witneying" piled fabrics.

1659. C. H. Roeckner, Marsh-street, Bristol. An improved method of constructing coffer dams and other similar structures for excluding or keeping back the flow of water and preventing inundations.

1661. J. Key and F. Potts, Birmingham. Certain means of producing designs in iron, and in the application of the same or designs formed in like manner of other metals to the manufacturing and ornamenting of bedsteads and other metal articles of furniture.

1663. J. Whitworth, Manchester. Improvements in shells.

1665. E. Lloyd, Bow Paper Mills, paper maker. Improvements in machinery for the manufacture of paper.

1667. J. Marson, Birmingham, gun manufacturer. A new or improved projectile for small arms and ordnance of every description.

Dated June 3, 1862.

1671. W. H. Hall, Birmingham, miners' lamp manufacturer. Improvements in miners' safety lamps.

1673. J. Biers, 5A Tottenham-court-road. Improvements in shoes for horses and other animals.

1675. J. L. Norton, Belle Sauvage-yard. Improvements in machinery for raising and forcing water.

Dated June 4, 1862.

1677. A. H. Perry, Brighton, railway inspector. Improvements in fastenings for and in the method of fastening together or securing railway chairs and sleepers and for other similar purposes.

1681. T. Allcock, Ratcliffe-on-Trent, Nottingham, agricultural implement manufacturer and mechanist. Improvements in the construction of horse-rakes.

1683. G. Allibon and E. Snell, Lewisham, engineers. Improvements in surface condensers and superheaters.

1685. I. and G. Battinson, Halifax, York, machine woolcombers. Improvements in machinery for combing wool and other fibres.

1687. F. P. Preston, Counter-hill, New-cross, engineer, and C. Goodman, George-street, Deptford, engineer. Improvements in the permanent way of railways.

1689. S. Huston, Deeping St. James, Lincoln. Improvements in safety valves.

Dated June 5, 1862.

1697. J. Keatley, Warwick, commercial clerk, and J. Tangye, Birmingham, manufacturer. An improvement or improvements in lifting jacks.

1698. R. Sill, Birmingham, grocer and tea dealer. An improved method of attaching direction cards, name plates, or other cards or plates, to trunks, packing cases, and other articles.

1699. P. M. Parsons, Blackheath, C.E., Improvements in ordnance, and in tools for rifling the same, parts of which improvements are applicable to small arms.

1701. E. Conroy, Boston, U.S., machinist. Improved machinery for cutting corks, bungs, and such like articles.

1703. W. E. Newton, 66 Chancery-lane, C.E. Improvements in the construction of organs and other wind instruments, parts of which improvements are also applicable for regulating the pressure and flow of gas and air. (A communication.)

Dated June 6, 1862.

1705. E. Death, Liecester, engineer. Improvements in road locomotives or traction engines.

1707. W. R. Jeune, Flower-terrace, Campbell-road, Bow. Improvements in the manufacture of fabrics suitable to be used as substitutes for solid leather.

Dated June 7, 1862.

1710. A. J. Adams, Devonport, naval outfitter. An improved method of rifling fire-arms.

1711. G. D. Hatton, Manchester, wholesale stationer and bookbinder. Improvements in presses.

1713. C. Hook, Bridgwater, Somerset, cutler. Improvements in the construction of steam engines.

Dated June 9, 1862.

1715. W. H. Turner, Blackburn, Lancaster, cotton spinner. Improvements in engines for carding cotton and other fibrous materials.

1719. J. M. R. Catteau, 333 Rue Saint Martin, Paris. Improvements in machinery for twisting wool, cotton, flax, silk, and other fibrous threads.

1721. F. Giachosa, Guy's Cliff Villa, Warwick. Improvements in ventilating mines, ships' holds, and other places.

1723. A. Knowles, Birstal Dye Works, Birstal, near Leeds, dyer and wool extractor. Improvements in apparatus for washing extracted wool and other fibre.

Dated June 10, 1862.

1727. J. A. Pols, Nye's-wharf, Grand Surrey Canal, Old Kent-road. An improved method of refining oils.

1728. N. Davis, 25 The Cedars, Putney. An improved propeller for ships or vessels.

1729. G. T. Jourdain, St. Paul's-terrace, Canonbury. Improvements in treating cocoa-nut oil.

1731. J. Alison, Brightland's, Reigate. Improvements in harrows, and in the apparatus for steering or guiding of such and other agricultural implements.

1732. J. B. Ingle, 37 King William-street, City, gentleman. Improvements in reaping and mowing machines. (A communication.)

1733. J. G. Appold, Wilson-street, Finsbury-square, gentleman. Improved apparatus for regulating the discharge of water and other liquids and air and other gases.

Dated June 11, 1862.

1735. W. Lennan, Dawson-street, Dublin, saddle and harness maker. An improved safety stirrup.

1737. H. Bland, Stuart-street, Luton, Bedford. Improvements in sewing machines.

1739. W. Crook, Blackburn, Lancaster. Improvements in looms for weaving.

1741. J. Marsh, New Sneinton, near Nottingham, machinist. Improvements in the manufacture of lace, and in the machinery employed therein.

1743. B. W. Gerland, Newton-le-Willows, Lancaster, chemist. Improvements in the manufacture of sulphate of copper, and in obtaining metals from the material used in such manufacture.

1745. J. Hetherington, Manchester, machine maker. Improvements in lubricating revolving surfaces.

Dated June 13, 1862.

1756. G. Haseltine, 100 Fleet-street, American barrister-at-law. Improvements in the construction and application of rails for railways. (A communication.)

1758. J. Wilson, 7 Albert-square, Clapham-road. Improvements in the construction of ships for war purposes, applicable also to the mercantile marine.

1760. C. A. Tyler, Birmingham, corn dealer. A new or improved holder for holding dinner and other plates and dishes, and for other like purposes.

1764. W. E. Newton, 66 Chancery-lane, C.E. An improvement in elongated bullets. (A communication.)

Dated June 14, 1862.

1768. T. Williams, 14 Red Lion-street, Clerkenwell, smith and engineer, and H. Cox, 22 Lower-street, Islington, gas engineer. Improvements in churns, partly applicable to washing machines.

1770. J. G. A. Dallot, L'Isle, Adam, France, joiner. A new portable circular saw.

1772. J. H. Johnson, 47 Lincoln's-inn-fields, gentleman. Improvements in Jacquard machines. (A communication.)

1774. R. A. Brooman, 166 Fleet-street, patent agent. Improvements in coking ovens, in collecting and utilizing the products resulting from the distillation or carbonization of coal and other matters producing coke, and in apparatus employed therein. (A communication.)

1776. R. Hicks, Kensington-park-terrace, gentleman. Improvements in the manufacture or preparation of paints, pigments, and colours.

Dated June 16, 1862.

1780. G. H. Birkbeck, 34 Southampton-buildings, Chancery-lane, engineer. Improvements in the construction of presses for extracting liquids from various substances. (A communication.)

1782. W. J. Curtis, Tufnell-park-road, Holloway, C.E. An improvement in the construction of screw propellers.

Dated June 17, 1862.

1784. J. E. Holmes, South-parade, Trafalgar-square, Chelsea, mechanical and civil engineer. Improved machinery for digging or cultivating land. (A communication.)

1790. J. Nield, iron founder, and T. A. Nield, engineer, Dukinfield, Chester. Improvements in moulding or manufacturing pipes, columns, or other similar articles of cast iron or other metals.

1794. W. Clark, 53 Chancery-lane, engineer. Improvements in the manufacture of buttons, and in apparatus for the same. (A communication.)

Dated June 18, 1862.

1798. J. H. Johnson, 47 Lincoln's-inn-fields, gentleman, Improvements in projectiles. (A communication.)

1800. F. Coltman, Normanton, York, carpenter. Improvements in apparatus for discharging coals, minerals, or other substances.

Dated June 19, 1862.

1804. G. Speight, 5 Saint John-street-road, manufacturer. An improvement in the manufacture of head ornaments.

1808. R. Stansfield, iron founder and machinist, and J. Dodgeon, mechanic, Todmorden, Lancaster. Improvements in looms for weaving.

1810. M. Wigzell, Strand, Topsham. Improvements in the form of bolts and other fastenings for shipbuilding and other purposes.

1812. J. B. Wood, Vernon-house, Camp-street, Broughton, near Manchester. Improvements in the manufacture of driving straps or bands, the backs of wire cards and cop tubes.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1839. G. T. Bousfield, Loughborough-park, Brixton. Certain new and useful improvements in steam engine valves. (A communication.) Dated June 21, 1862.

1845. G. Haseltine, 100 Fleet-street, American barrister-at-law. Improvements in machinery for mowing and reaping, the driving gear employed being applicable to machines for other purposes. (A communication.) Dated June 23, 1862.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

424. T. Birdsall and J. Birdsall. Preparing hides.
428. R. Watkins. Oil and spirit lamps.
430. J. Lees. Trap.
433. W. Bush. Omnibuses.
435. C. T. Marzetti and J. Watson. Apparatus for raising and lowering.
443. W. Hinton. Barometers.
444. W. Davis. Illuminating.
450. J. Friedlaender. Preparing flax.
451. E. M. Stoehr. Manufacture of manganese. (A communication.)
459. J. Spence. Weighing, screening, and fanning grain. (A communication.)
461. H. Ward. Ladies' saddles.
465. R. and W. E. Pickin. Manufacture of carriage bodies.
469. H. Chevasse, T. Morris, and G. B. Haines. Manufacture and ornamentation of metallic bedsteads.
473. A. Bornemann. Constructing fountains.
474. J. Millington. Hearse or bier.
476. C. H. J. W. M. Liebmann. Felted fabrics.
480. G. Blakey, S. Blakey, J. Blakey, and B. White. Leggings or gaiters.
482. B. Foster. Construction of horticultural buildings.
483. W. B. Johnson. Steam engines.
488. J. C. Haddan. Small arms.
489. R. Waller. Machinery and apparatus for joining leather.
497. F. St. G. Smith. Machinery for grinding or reducing quartz. (Partly a communication.)
504. E. Bliss and H. Lamplough. Viewing microscopic photographs and other minute objects.
516. A. Green. Bordering paper, envelopes, and cards.
529. W. P. Savage. Fire-arms.
533. T. Adams. Effecting an equilibrium of the steam pressure upon valves.
550. J. L. Charcouchet. Breaking stone.
554. T. Bradford. Washing machines.
570. J. W. Davis and F. Davis. Supplying feed water to steam boilers.
595. J. Sidebottom. Fire-arms and ordnance.
621. G. Edmonson. Washing machines.
745. M. A. F. Mennons. Arresting headstrong or runaway horses. (A communication.)
751. T. Dunn. Construction of bridges.
799. B. Gladstone. Tilting or tipping waggons.
843. J. Haworth. Conveying telegraphic messages.
863. W. A. Ashe. Driving the propelling shafts of ships or vessels. (A communication.)
1020. E. Funnell. Self-acting indicator signal for railways.
1097. J. Barbour. Hand hammers. (A communication.)
1208. G. Richards. Ordnance.
1473. C. Attwood. Manufacture of steel and iron.
1618. R. Griffiths. Marine propellers.
1650. L. Chaubart. Apparatus for raising the level of water in rivers, canals, and other water courses.
1712. G. Haseltine. Photographic camera. (A communication.)
1812. J. B. Wood. Driving straps.
1839. G. T. Bousfield. Steam engine valves. (A communication.)
1845. G. Haseltine. Mowing and reaping.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed June 27, 1862.

3264. N. McHaffie.
3275. R. A. Brooman.
3276. A. and J. Edward.
2. N. C. Szerelmey.
5. J. Walker.
6. T. C. Clarke.
8. R. A. Brooman.
11. B. Rhodes.
13. W. B. Patrick.
14. E. F. Davis.
20. W. A. Fell.
22. G. Jeffries.
27. W. E. Gedge.
71. J. Carter.
89. T. Gilbert.
131. T. Emmott.
141. L. Barbat.
239. W. E. Newton.
689. E. T. Hughes.

Sealed June 30, 1862.

25. G. Stracey.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1520. G. Redrup.
1524. T. Howard.
1538. G. Dawes and C. J. Carr.
1540. A. V. Newton.
1541. J. M. J. Baillie.
1557. R. A. Brooman.
1533. G. Wrigley.
1535. B. Burton.
1546. T. Wight.
1552. G. Baker.
1559. T. Bell.
1562. J. A. Wilkinson.
1656. W. A. Munn.

PATENTS ON WHICH THE SEVENTH YEAR'S STAMP DUTY HAS BEEN PAID.

1274. G. Green.
1445. I. J. Silberman.
1456. F. Leiss and C. Schneider.

LIST OF SPECIFICATIONS PUBLISHED

During the week ending June 28, 1862.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s. d.		s. d.		s. d.		s. d.		s. d.		s. d.
2865	0 6	2881	0 3	2897	0 9	2913	0 3	2929	0 3	2945	0 7
2866	0 3	2882	1 5	2898	1 0	2914	0 6	2930	0 3	2946	0 3
2867	0 3	2883	1 9	2899	2 11	2915	0 10	2931	0 6	2947	0 3
2868	0 3	2884	0 6	2900	0 8	2916	1 4	2932	0 3	2948	0 8
2869	0 6	2885	0 6	2901	0 7	2917	0 3	2933	0 11	2949	0 7
2870	0 3	2886	0 10	2902	0 6	2918	0 3	2934	0 3	2950	0 4
2871	0 3	2887	0 10	2903	0 4	2919	3 10	2935	0 4	2951	0 3
2872	0 3	2888	0 6	2904	0 3	2920	0 7	2936	0 3	2952	0 3
2873	0 3	2889	0 3	2905	0 3	2921	0 3	2937	0 3	2953	0 3
2874	0 3	2890	0 3	2906	0 3	2922	0 3	2938	0 9	2954	0 10
2875	1 3	2891	0 10	2907	0 6	2923	0 3	2939	0 3	2955	0 7
2876	0 3	2892	0 3	2908	0 8	2924	0 3	2940	0 7	2956	0 3
2877	0 9	2893	0 9	2909	0 6	2925	0 3	2941	0 3	2957	0 10
2878	0 11	2894	1 1	2910	0 3	2926	0 3	2942	0 6	2958	0 11
2879	0 3	2895	0 9	2911	0 3	2927	0 3	2943	0 3	2959	0 10
2880	0 3	2896	0 10	2912	0 7	2928	0 10	2944	0 4	2960	0 7

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

PRICES CURRENT OF METALS.

London, July 3, 1862.

		£	s.	d		£	s.	d	
IRON:									
Rails in Wales and North of England	pr. ton	5	0	0	to	5	5	0	nett
Welsh Bars, in Wales	,,	5	5	0	,,	5	7	6	,,
Staf. Bars, at the Works ..	,,	7	0	0	,,	7	5	0	,,
,, Hoops	,,	7	10	0	,,	8	0	0	,,
,, Sheets, Singles	,,	9	0	0	,,	10	0	0	,,
,, Nail Rods	,,	5	15	0	,,	6	10	0	,,
,, Boiler Plates	,,	8	0	0	,,	8	10	0	,,
Scotch Pig, M.-Nos. Warrants, at Glasgow	,,	2	10	6	,,	2	14	0	nett
Do. No. 1, Good Brands ..	,,	2	11	6	,,	2	15	0	,,
Scotch Bars	,,	7	5	0	,,	7	15	0	,,
Swedish Bars, in London ..	,,	10	10	0	,,	11	0	0	,,
COPPER:									
Sheet and Sheathing	per lb.	0	0	11	,,	0	0	0	3
Tough Cake and Tile......	pr. ton	98	0	0	,,	0	0	0	,,
Best Selected	,,	101	0	0	,,	0	0	0	,,
Australian	,,	99	0	0	,,	0	0	0	,,
South American	,,	0	0	0	,,	0	0	0	,,
Yellow Metal Sheathing ..	per lb.	0	0	9	,,	0	0	0	2½
STEEL:									
Swedish Keg..............	pr. ton	15	0	0	,,	0	0	0	2½
,, Faggot	,,	16	0	0	,,	0	0	0	,,
TIN:									
English, Block............	p. cwt.	6	0	0	,,	0	0	0	2½
,, Bar..............	,,	6	1	0	,,	0	0	0	,,
Foreign, Banca	,,	6	5	0	,,	0	0	0	nett
,, Straits	,,	5	17	0	,,	0	0	0	
TINPLATES:									
Charcoal, I.C.	pr. box	1	7	0	,,	1	9	0	
Coke, I.C................	,,	1	1	6	,,	1	4	0	
LEAD:									
Pig, English..............	pr. ton	20	0	0	,,	21	0	0	2½
,, Spanish	,,	19	10	0	,,	19	15	0	,,
Common Sheet	,,	21	0	0		0	0	0	,,
Tea ,, (Wimshurst's Patent) A special disct...	,,	25	0	0	,,	0	0	0	,,
SPELTER:									
On the spot	,,	17	10	0	,,	18	0	0	net
For arrival	,,	17	10	0	,,	17	15	0	,,
ZINC:									
English Sheet	,,	23	0	0	,,	0	(	0	1
UICKSILVER..............	pr. btl.	7	0	0	,,	0	0	0	3

JAMES LAURIE, Metal Broker.
50 King William Street. ,C.

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, JULY 11, 1862.

GUNS FOR NAVAL WARFARE.

PROVERBS, it is said, are the concentrated wisdom of ages—axioms of universal acceptation have the value of proverbs. There is no axiom with a better foundation on truth, or better understood and acted upon in this country, than that which says, "if you wish to be "at peace, be prepared for war." It expresses briefly and tersely the foreign policy of the British Empire. For England, whose might and power are in her naval armaments, there is no preparation for war more intensely practical or imperative than the possession of the most effective gun in the world for naval warfare.

We are glad to show that in devoting so large a space in our columns as we have lately done to warlike questions, we are the advocates of peace, and it is in that point of view we propose to call attention to the interesting discussions which took place at the recent meetings of the Royal United Service Institution. We shall take occasion to pass in review the merits of the different kinds of guns used or proposed for the service, and endeavour to assist the public in forming correct notions out of the discordant and naturally interested or prejudiced statements of rival inventors and their partizans.

On the first day of the meetings referred to, the Duke of Somerset, First Lord of the Admiralty, in the chair, a paper was read by Captain E. Gardiner Fishbourne, R.N., C.B., on "the "character of gun best adapted for naval war- "fare, as gathered from the various plans of "guns proposed."

The subject excited so much interest that the meetings extended over three successive evenings, and were numerously attended by naval and military officers, as well as engineers, gun manufacturers, and men of science, amongst whom General Anstruther, Col. Wilford, R.A., Lieut-Colonel Clay, Col. Lefroy, R.A., Capt. Blakely, Sir W. Armstrong, Vice-Admiral Sir Fred Grey, Mr. Charles Lancaster, Mr. Haddan, Mr. Bashley Britten, Mr. Michael Scott, C.E., Commander Scott, Admiral Taylor, C.B., Admiral Halsted, and Mr. G. Rendel, took part in the discussion in the order in which they are named.

Nothing could be more calm, candid, explicit, or intelligible, than the able exposition of Captain Fishbourne's views, which he illustrated with diagrams, tables, and references to artillery experiments. It was at once instructive and suggestive, and it had the merit of bringing forward the inventors of different systems of guns, to take part in the discussion and explain the principles and modes of construction of their inventions, each in turn attacking his competitor,—an excellent way of getting at the truth.

We have observed with regret that scientific meetings have too often been made the occasion for inventors or manufacturers to advertise their plans or processes. We do not know whether the same idea floated in the mind of Captain Fishbourne, but we heard him with pleasure conclude his address by "calling on "those gentlemen who have displayed so much "talent in working out their respective plans "to look at the question less from a personal "and more from a national point of view."*

* He has a right to hold this language, because he is not a gun inventor, or an interested partizan. He is an impartial judge.

The Duke of Somerset cordially echoed that sentiment, and alluding probably to some hard blows aimed at a particular kind of gun which has received an unlimited amount of national support, His Grace expressed a hope "that the "discussion would be carried on by those "who had considered the subject, fairly and "calmly."

We will follow this rule, although we cannot say it exercised its full influence on all those who addressed the meeting. One remarkable effect of the freedom with which the different speakers delivered their sentiments is, that the kind of fascination, which the supposed super-excellence of the Armstrong gun held over the minds of professional men, is dissipated; and many of its ardent admirers have learnt that possibly there may exist other guns which not only equal but surpass it in efficiency. This change of opinion is the effect of the plain, manly, outspoken manner in which the gallant officer recanted the favourable opinion he had once been led to form of Sir W. Armstrong's system. "Having been captivated (he said) "by the beauty of the mechanism of the Arm- "strong gun, its great ranges, reported accuracy, "and the undoubted genius of its constructor, "I incidentally gave in this place a too un- "qualified assent to all that had been claimed "for it. Finding that, in some respects, I had "been misinformed on a point of such national "importance, it became my duty to give equal "publicity to my withdrawal of that assent."

This proves the honesty of his conviction, and leads one to the reflection that the extravagant praise lavished on this gun in official reports, and in the naval and military intelligence of a great contemporary, have produced the usual effect of exaggeration which, by creating a reaction, will help to remove a delusion that for the national interest has been too long kept up.

In our preliminary summary of the elaborate details contained in the paper which opened the proceedings, and in the discussions which followed, we can only touch upon the leading points necessary to give our readers a correct notion of the state of this important question. Captain Fishbourne, reviewing the great change in naval warfare, which must result from the conversion of men-of-war into iron-clad vessels, goes straight to the conclusion, that actions at sea will henceforth be fought at short ranges, or, which is the same thing, that long shots will be comparatively innocuous. He shows, by the most conclusive reasoning, founded on facts and acknowledged scientific data, that from disturbing and unavoidable causes in naval warfare the accuracy of rifled guns cannot be relied upon, and that, in fact, the very excellence of the rifled Armstrong ordnance—its nicety of adjustment and perfect aim, which are its chief merits—render it unfit for naval service. At short range the initial velocity and penetrating force of the rifled 110-pounder is less than the smooth-bore 68-pounder, to which he gives the preference; and having cited a pamphlet by Mr. Michael Scott, C.E., in which the value of smooth bore guns and improved shot are set forth, he enumerates the conclusions he has come to in the following terse passage: "To the extent that "we have adopted rifled guns, to the exclusion "of smooth-bores, for the navy, we have given "up the substantial advantages of low trajec- "tories, straight ricochet, smashing force, "simplicity, and economy, for the very occa- "sional advantages of long range. Therefore, "for efficiency, no less than for economy, we "must revert to the smooth-bore in principle, "and invest talent and money to develope its "merits."

More truths, each of great value, and stronger arguments in forcible language, which even the unprofessional can understand, could not be comprised in fewer words. In support of his conclusion he quotes a *dictum* of Sir H. Douglas, that "the main principle which "should govern our choice of naval guns, is to "prefer those which, with equal calibre, "possess the greatest point-blank range;" and adds, "this was the correct view to have taken "before the introduction of iron-coated ships; "since that we have no choice, as no other "guns will be completely effective against iron "plates, if against other ships either."

He then gives his opinion, "that breech- "loaders should be excluded, as they are "dangerous," and he condemns the coil system for the following reasons:—"The coils are "shrunk on hot; the metal, of course, con- "tracts in every direction, consequently the "joints open—it were impossible they should "be close—the overlapping pieces at the joints "indicate the knowledge of this defect. All "these points of weakness, and the whole of "the great vibration which takes place every "time the gun is fired, must be thrown in turn "on these separate parts, and not distributed, "owing to the continuity being broken, which "must lead early to the disintegration of the "gun." He concludes by insisting that "the "maximum initial velocity is the primary con- "sideration," and he shows by a train of undeniable argument, that this can only be attained by firing round shot with high charges from a smooth-bore gun. As to shells, although he admits the excellence of the Armstrong rifled gun for throwing them at long ranges, he considers "the uncertainty and danger of high "charges (with rifled guns) is such that it "becomes a question whether, even for special "though unfrequent service, they should be "used on shipboard."

Many other considerations relating to the construction of guns and artillery practice at sea are ably and fairly dealt with. All the points of the question, velocity, penetrating effects, trajectories at long and short ranges, windage, rifle grooving, recoil, are examined *seriatim* in this remarkable paper, which, together with the discussion to which it gave rise, supplies a mass of valuable information, from the analysis of which, from time to time, we hope to be able to extract the truth, and lay open to our readers the *arcana* of the science of gunnery. That this, perhaps, is not an easy task, that popular instruction is much wanted on this subject, will, we think, be admitted when the noble Duke who presided at the first day's meeting, found it necessary, in taking a neutral position, to say:—"I have read a great "deal, and heard a great deal, about guns of "all kinds; of what I have heard there is a "great deal I do not believe, and very little "that I do believe." When the first Lord of the Admiralty makes this admission, we can understand how helplessly the board, in the exercise of its executive duties, relies upon the Controller's Department; and it furnishes the strongest proof that that department, or some other properly constituted body, should possess the scientific and practical knowledge, on all technical matters, necessary to guide the administrative branch of the Admiralty.

Sir William Armstrong's system was rudely assailed by other speakers. He had to defend it from multitudinous attacks. We will not say he was not equal to the occasion, but he was not prepared on the first night to "answer "the large number of facts advanced, or on "the spur of the moment to go into a complete "refutation." On the following evening he came forward with his defence, which we will com-

ment upon on another occasion. In the meantime, we may say the *prestige* of the Armstrong gun is gone. Stripped of the rhodomontade of partizan writers, the whole question of gunnery, thanks to the lucid and courageous exposition of Captain Fishbourne, will be rationally and dispassionately reviewed.

THE ORDNANCE SURVEY.

HAVING recently had an opportunity of inspecting the vast establishment at Southampton, known as the Ordnance Survey Office, and being deeply impressed by the importance of the work in progress there, we have this week the pleasure of laying before our readers the results of our observations. It may be well to state primarily that the survey of the United Kingdom is based upon and connected with a triangulation which extends over the whole country. The distance between the trigonometrical stations are derived from measured base lines on Salisbury Plain, and on the shore of Lough Foyle, in the north of Ireland. This most important, and indeed vital branch of the work, has been executed with the greatest possible degree of accuracy, the difference between the measured lengths of the bases of verification and their computed lengths not exceeding two and a-half inches in seven miles. In effecting this extraordinary degree of exactitude, a standard bar of iron has been used for the purposes of measurement, and, of course, on all occasions of the employment of this instrument, the temperature was taken into account. A few degrees higher or lower on the thermometric scale, as our readers are aware, would tell in the shape of expansion or contraction on a bar of iron, and hence the necessity for extreme care in using it as a standard of measurement.

The average length of the sides of the triangles in the principal triangulation is about 60 miles; but many of the sides exceed 100 miles in length. The primary triangulation is next broken up into smaller triangles, the sides of which are from five to ten miles long, and this second system of triangulation is again broken up into triangles, the sides of which are about one mile long. These form the tertiary, or minor triangulation.

The persons employed to make the detailed survey next actually measure the length of each side of the minor triangles on the ground, noting down most carefully in their "field-books" every fence, stream, or other object they may happen to meet with in the operation. They then measure cross lines from one side of the triangle to the other, and by taking off-sets from the measured lines to every object on the face of the country, they obtain in their field-books the data for plotting accurate plans of the country to any scale that may be required. The length of every measured side of a triangle is, therefore, checked by the computed trigonometrical distance, while the accuracy of the lines within each triangle is checked by the plotting, and thus the risk of error on the part of the surveyors is completely obviated. It will be seen, indeed, that by this method not only is perfect accuracy of measurement obtained, but every object is placed in its exactly relative position to every other object, however distant. Thus, for example, any house shown on a plan of part of the centre of the kingdom is not only in its correct relative position to any other house in its own immediate neighbourhood, but it is also shown in its correct relative position to any and every house from Cornwall to Caithness. It is needless for us to point out the exceeding value of exactness in making these preliminary measurements, because it will be obvious to all. The corps of Royal Engineers, to whom the work is entrusted, are, however, so well trained in their duty, that they perform it unerringly, and the checks employed, in ninety-nine cases out of a hundred, only demonstrate the correctness of their labours.

As regards the levels which are engraved on the plans issued from the Ordnance Survey Office, they are all given in relation to one datum level. That for Great Britain is the level of mean tide at Liverpool, and in relation to this principal lines of levels have been carried all over the kingdom, from Cape Wrath to Land's End. Thus, again, the levels which are published on the plans are strictly correct, relatively to each other, no matter how widely separated the places may be.

The scales which have so far been adopted for the Ordnance Survey of Great Britain are as follows :—

TOWNS—$\frac{1}{500}$ of the actual linear measure.

PARISHES—$\frac{1}{2500}$, or 25,344 inches to a mile, in cultivated districts.

COUNTIES—6 inches to a mile.

THE KINGDOM—1 inch to a mile.

The parish plans on the 25-inch scale, or the scale of one inch to one acre, have been traced, and thirty copies taken by the process of zincography. The whole of the parish plans would have been treated in the same way; but a decision of the House of Commons some time since caused the making of such plans to be discontinued. Tables containing the area of each separate enclosure are published with the thirty plans in question. Each street is to be obtained separately. Collectively they are one and a half miles long, and one mile wide, and, therefore, contain an area of 960 acres.

The plans of parishes on the $\frac{1}{2500}$ scale have been published. These have been multiplied either by the lithographic, zincographic, or the anastatic process. The first mode has fallen somewhat into disuetude at Southampton, but it may not be improper to give some sort of description of the process here, as well as of those which have, to a certain extent, supplanted it. There are some points of difference in the lithographic operation as relating to mapping and ordinary lithography, and this will justify our explanations of the former. The plan is first traced with lithographic ink on tracing paper, which has first been thinly coated with starch or paste. For the sake of economy, the general outline is traced by boys, the forests, woods, and figures being stamped, or, in other words, imprinted by the same youthful artists. Thus the writing and other details which require delicate manipulation alone remain for the duty of the practised draftsman. The lines on the tracing require to be, and must be, boldly drawn. When completed, the tracing is laid between sheets of damp paper, and is thus made ready for transference to stone. This is previously polished by aid of pumice-stone until a good surface is obtained, the final polish being administered by the use of a piece of "water of "Ayr" stone, or other steatite. The lithographic stone thus prepared for its important duty, next receives the tracing. The whole is passed now about a dozen times through the lithographic printing press, care being taken to damp the tracing occasionally during the process. The paper is then removed, and it will be found that the ink from the tracing has adhered to the stone to which, therefore, the drawing has been transferred.

Great care is required during this operation, so as to preserve the surface of the stone from the contact with oil or grease, for both of which it has a great affinity. The next process is to etch the stone with diluted nitric acid, and afterwards to pour on it a solution of gum-arabic. The acid effects a chemical change on the surface of the stone, and thus diminishes its attraction for grease. It also removes any particles of grease which may have adhered to the stone, and, by opening its pores, enables it the better to imbibe moisture. The gum water fills up the pores, and prevents the blank parts of the stone from taking up the ink in printing. The stone is next washed over with turpentine, to remove all but the fatty portions of the transfer ink, after which the printing roller is passed over it, or it is rubbed with a piece of flannel charged with printing ink, which is, perhaps, better in its results than the roller.

When the lines have thus been sufficiently charged with ink, the printing is commenced, the paper on which the impressions are to be taken being previously damped. After each impression, the printing roller is passed over the stone, which is also kept damp by sponging. Usually, the sheets resulting from these operations are clear and truthful, the percentage of failures being small indeed. The disadvantage attending the work is, however, in the great weight of the stones, and their liability to fracture. Hence it is that at the Southampton Works zinc has been of late largely substituted.

The zinc plates intended for map-printing are usually about $\frac{1}{8}$th of an inch in thickness. They are prepared by careful rubbing, in the first place, with "water of Ayr," stone and finishing off with the finest sand, and water applied by aid of a zinc muller. The drawing is made, and transferred, as in the lithographic process; but instead of using nitric acid, the zinc plate is etched with a solution of nut-galls. Should any alteration be required in the drawing after transfer, the defective work may be removed by the application of "water of Ayr" stone, or the lines may be obliterated by the application of a solution of fused potash. It is astonishing, however, to what a slight depth the lines actually extend, and how soon, therefore, a zinc plate may be freed from them, and made ready to receive other impressions.

We come now to what is known as the Anastatic process, which is patented, and which promises, when fully developed, to be of immense value. Briefly it may be said that by its means a print, however old, and if originally made by a greasy ink, may be transferred to a zinc plate, and then that copies to any extent are obtainable by printing from the plate.

In successfully employing the Anastatic process, it must be first ascertained, by rubbing a piece of thin paper over some part of the drawing which it is intended to copy, whether the ink is so fixed as that no trace of it will come off by pressure. If this prove to be the case the drawing or print must be immersed for some minutes in a hot solution of strontia—in the proportion of about one ounce of strontia to a quart of water. This has the effect of loosening the ink. The drawing or print must next be partially dried, and afterwards immersed in a solution of nitric acid—in the proportions of one of acid to six of water. If the print be comparatively new, the strontia bath may be dispensed with, that of the acid being sufficient.

The drawing is then ready to be transferred to a zinc plate, previously polished with flour of emery. This done, a sheet of paper, damped with nitric acid, is placed over the drawing, and the press is put into requisition. The transfer is effected by passing the plate through an ordinary copper-plate printing press. After-

wards the drawing is removed, and the plate wiped over with gum-water. It is then charged with printing ink, and subsequently etched with phosphoric acid, of which a few drops are mixed with gum-water. The plate is thus made ready for printing, and may be used in a manner precisely similar to that spoken of in reference to zincography. We have said that the Anastatic process is likely to become one of great practical value; and, indeed, it is difficult to see where its usefulness will end. On the occasion of our recent visit to the Survey Office, we observed that a portion of the celebrated and original Domes-day Book was being copied by these means. The results, so far as the proof sheets shown to us went, were admirable. Fac similes of the ancient chronicles of England were being obtained without any apparent injury to the venerable and venerated documents themselves; and it was manifest that ancient prints, engravings, or drawings, might be faithfully copied in the same inexpensive and yet most effectual manner.

We will now speak of the reduction of plans by photographic agency. At the Southampton works this is accomplished with an amount of elegance, ease, and precision which is remarkable. The plans of towns on the $\frac{1}{500}$ scale, and those of cultivated districts on the $\frac{1}{2500}$ scale, are regularly reduced to the scale of six inches to the mile, preparatory to engraving, by photography. The collodion process is employed for the purpose of taking the negative copy. The lens of the camera is a single achromatic meniscus, 3½-inches in diameter, with a principal focal length of twenty-four inches. The mode of procedure is after the following fashion:—The plan to be reduced is attached to a board, which can be, by means of a screw or nut, adjusted to any height above the floor which may be required. The board is also moveable on a central pivot. The camera is placed opposite to it upon a table running upon wheels over a small tramway, laid down on the floor of the photographic room.

The required scale of the reduction is obtained by tracing on the ground glass of the camera a rectangle corresponding on the reduced scale with the rectangle of the plan to be produced. The curvature of the image, and indistinctness of outline from spherical aberration, are both remedied by reducing the diaphragm in front of the lens to a small aperture. The negative, having been obtained upon glass, is placed in the printing frame in contact with sensitive paper, and in this manner as many positive prints as may be required are taken in rapid succession. In thus reducing the plans of the Ordnance Survey, it has been found convenient, first, to colour the houses yellow, by which means they print sharp and black on the paper, the yellow rays having no effect upon the sensitive coating of the glass plate upon which the negatives are taken. The introduction of this process has very much lessened the cost of reducing plans, and saves an immense amount of time and labour.

(To be continued.)

A new discovery in locomotion has been made in France, and it is considered to be of so much importance that a Commission has been appointed by the Emperor to examine and report upon it. M. Girard has constructed the model of a railway adapted for runners like those of a sledge. The runners move in a sort of clog; between this and the rails water is introduced, and thus almost all friction is avoided. Should this plan prove successful on a large scale, much wear and tear, not only of the carriages, but of the passengers' nerves, will be saved. How delightful it will be to slide smoothly over a surface of water, instead of having one's bones dislocated by being rattled over uneven rails, and having one's head stupified by the perpetual clatter.

ANCIENT ROMAN COINERS AND SMASHERS.

It is a well authenticated fact that the Romans of old were adepts in the art of counterfeit coining, and to this day it is no uncommon thing for counterfeit coins, and the moulds by which they are fabricated, to be turned up by the plough of the husbandman, or the spade of the antiquarian, on the sites of Roman cities, and encampments in our own country. In France, too, spurious coins cast by the same ingenious but unscrupulous manipulators are often brought to light. At Lyons, not long since, a large number of moulds, which had evidently been used in the nefarious practice of illegitimate money making, was discovered. The substance of them is a baked white clay, much resembling the pipe-clay of modern times. Their shape is flat, and they are about an inch and a half in diameter. They are about two-tenths of an inch in thickness at the edges, and this is diminished in the centre by the depth of the coin, the type of which remains clearly impressed. Each mould has a notch or indentation on one part of its edge which reaches to the vacant space formed by the body of the impressed coin, and as the flat shape and equality of the circumference of the moulds adapts them for joining together in such an arrangement as to bring the types of heads opposite to those of reverses, it is at once apparent that the furrows made by the indentations served as jets or casting holes to the series.

An ingot of debased silver found at the same time and place as these moulds, the green oxide of which indicated the large amount of copper incorporated with it, leaves no room to doubt that the moulds had been used for obtaining imitations of silver rather than of gold money. It appears, therefore, that the mode of casting spurious coins by the ancient Romans very much resembled that practised by modern Londoners. The quality of the clay used by the old coiners is, however, worthy of remark. This was so excellent and so well prepared that, after the lapse of 1400 years, the moulds are perfect enough to receive several castings.

One of the enactments of the celebrated Theodosian code of laws recognised the class of offence referred to, and prescribed a punishment for it. Freely translated, this runs as follows:—"If any one shall fabricate coins by false casting, we command all his property to be given up to the Treasury, in order that the business of coining may be carried on only in our own Mints." We question whether a law of this nature would be of much value in England as a determent from the commission of the crime, for it is now usually perpetrated by those whose property, if confiscated, would add little to the "balance in hand" of the Chancellor of the Exchequer. The Roman rogues understood the art of false coining too by the plating process, but casting was the favourite method; and Pliny remarks that so dextrous were they at the work, that it was often difficult to distinguish a genuine from a base coin. Some of the latter, indeed, he asserts, were so well executed that the curious often gave many good coins in exchange for a false one. The decline of the art of engraving, which in the time of Septimus Serverus had become very noticeable, together with the alteration made in the standard of money by that monarch, were very favourable to forgers and false coiners, and made their deceptions more easy. The number of moulds discovered at various periods at Lyons, and in its neighbourhood, makes it more than probable that these false coiners existed then in great numbers during the Roman occupation. At Rome itself it is on record that so considerable were they in number, that in the time of the Emperor Aurelius they formed a little army; and as a proof of the good understanding existing among them, it may be mentioned that when they were threatened with punishment they revolted against his Imperial Majesty, and killed at the first onset 7,000 of the regular troops! This fact will probably be deemed sufficient to demonstrate the extent to which coining and smashing were carried on when Rome was mistress of the world. The practice of imitating coins of the realm began almost simultaneously with the invention of money, and there is something so tempting about it, that it is likely to continue in existence so long as coin is required and used for the purposes of traffic—that is till the millenium—the date of which perhaps Dr. Cumming will tell us. Meantime the principal safeguard for the public lies in the faultless ornamentation and manipulation of genuine coins, and to these points every state should scrupulously attend. It is highly improper to issue coins from any mint which, from imperfect workmanship or slovenly engraving, invite the skill of the counterfeiter to imitate them. Repressive laws have their influence no doubt, but to make the crime of false coining an impossibility by the means described seems to us the best way of suppressing it.

ON FORCE.*

The existence of the International Exhibition suggested to our Honorary Secretary the idea of devoting the Friday evenings after Easter of the present year to discourses on the various agencies on which the material strength of England is based. He wished to make iron, coal, cotton, and kindred matters, the subject of these discourses; opening the series by a discourse on the Great Exhibition itself; and he wished me to finish the series by a discourse on "Force" in general. For some months I thought over the subject at intervals, and had devised a plan of dealing with it; but three weeks ago I was induced to swerve from this plan, for reasons which shall be made known towards the conclusion of the discourse.

We all have ideas more or less distinct regarding force; we know in a general way what muscular force means, and each of us would less willingly accept a blow from a pugilist than have his ears boxed by a lady. But these general ideas are not now sufficient for us; we must learn how to express numerically the exact mechanical value of the two blows; this is the first point to be cleared up.

A sphere of lead weighing 1lb. was suspended at a height of 16 feet above the theatre floor. It was liberated, and fell by gravity. That weight required exactly a second to fall to the earth from that elevation; and the instant before it touched the earth, it had a velocity of 32 feet a second. That is to say, if at that instant the earth were annihilated, and its attraction annulled, the weight would proceed through space at the uniform velocity of 32 feet a second.

Suppose that instead of being pulled downward by gravity, the weight is cast upward in opposition to the force of gravity, with what velocity must it start from the earth's surface in order to reach a height of 16 feet? With a velocity of 32 feet a second. This velocity imparted to the weight by the human arm, or by any other mechanical means, would carry the weight up to the precise height from which it has fallen.

Now the lifting of the weight may be regarded as so much mechanical work. I might place a ladder against a wall, and carry the weight up a height of 16 feet; or I might draw it up to this height by means of a string and pulley, or I might suddenly jerk it up to a height of 16 feet. The amount of work done in all these cases, as far as the raising of the weight is concerned, would be absolutely the same. The absolute amount of work done depends solely upon two things: first of all, on the quantity of matter that is lifted; and secondly, on the height to which it is lifted. If you call the quantity or mass of matter m, and the height through which it is lifted h, then the product of m into h, or mh, expresses the amount of work done.

Supposing, now, that instead of imparting a velocity of 32 feet a second to the weight we impart twice this speed, or 64 feet a second. To what height will the weight rise? You might

* Lecture by Prof. Tyndall at the Royal Institution, June 6th, 1862.

be disposed to answer, "To twice the height;" but this would be quite incorrect. Both theory and experiment inform us that the weight would rise to four times the height: instead of twice 16, or 32 feet, it would reach four times 16, or 64 feet. So also, if we treble the starting velocity, the weight would reach nine times the height; if we quadruple the speed at starting, we attain sixteen times the height. Thus, with a velocity of 128 feet a second at starting, the weight would attain an elevation of 256 feet. Supposing we augment the velocity of starting seven times, we should raise the weight to 49 times the height, or to an elevation of 784 feet.

Now the work done—or, as it is sometimes called, the mechanical effect—as before explained, is proportional to the height, and as a double velocity gives four times the height, a treble velocity nine times the height, and so on, it is perfectly plain that the mechanical effect increases as the square of the velocity. If the mass of the body be represented by the letter m, and its velocity by v, then the mechanical effect would be represented by $m\ v^2$. In the case considered, I have supposed the weight to be cast upward, being opposed in its upward flight by the resistance of gravity; but the same holds true if I send the projectile into water, mud, earth, timber, or other resisting material. If, for example, you double the velocity of a cannon-ball, you quadruple its mechanical effect. Hence the importance of augmenting the velocity of a projectile, and hence the philosophy of Sir William Armstrong in using a 50lb. charge of powder in his recent striking experiments.

The measure then of mechanical effect is the mass of the body multiplied by the square of its velocity.

Now in firing a ball against a target the projectile, after collision, is often found hissing hot. Mr. Fairbairn informs me that in the experiments at Shoeburyness it is a common thing to see a flash of light, even in broad day, when the ball strikes the target. And if I examine my lead weight after it has fallen from a height I also find it heated. Now here experiment and reasoning lead us to the remarkable law that the amount of heat generated, like the mechanical effect, is proportional to the product of the mass into the square of the velocity. Double your mass, other things being equal, and you double your amount of heat; double your velocity, other things remaining equal, and you quadruple your amount of heat. Here then we have common mechanical motion destroyed and heat produced. I take this violin bow and draw it across this string. You hear the sound. That sound is due to motion imparted to the air, and to produce that motion a certain portion of the muscular force of my arm must be expended. We may here correctly say, that the mechanical force of my arm is converted into music. And in a similar way we say that the impeded motion of our descending weight, or the arrested cannon ball, is converted into heat. The mode of motion changes, but it still continues motion; the motion of the mass is converted into a motion of the atoms of the mass; and these small motions, communicated to the nerves, produce the sensation which we call heat. We, moreover, know the amount of heat which a given amount of mechanical force can develop. Our lead ball, for example, in falling to the earth generated a quantity of heat sufficient to raise the temperature of its own mass three-fifths of a Fahrenheit degree. It reached the earth with a velocity of 32 feet a second, and 40 times this velocity would be a small one for a rifle bullet; multiplying three-fifths by the square of 40, we find that the amount of heat developed by collision with the target would, if wholly concentrated in the lead, raise its temperature 960 degrees. This would be more than sufficient to fuse the lead. In reality, however, the heat developed is divided between the lead and the body against which it strikes; nevertheless, it would be worth while to pay attention to this point, and to ascertain whether rifle bullets do not, under some circumstances, show signs of fusion.

From the motion of sensible masses, by gravity and other means, the speaker passed to the motion of atoms towards each other by chemical affinity. A collodion balloon filled with a mixture of chlorine and hydrogen was hung in the focus of a parabolic mirror, and in the focus of a second mirror, 20 feet distant, a strong electric light was suddenly generated; the instant the light fell upon the balloon, the atoms within it fell together with explosion, and hydro-chloric acid was the result. The burning of charcoal in oxygen was an old experiment, but it had now a significance beyond what it used to have; we now regard the act of combination on the part of the atoms of oxygen and coal exactly as we regard the clashing of a falling weight against the earth. And the heat produced in both cases is referable to a common cause. This glowing diamond, which burns in oxygen as a star of white light, glows and burns in consequence of the falling of the atoms of oxygen against it. And could we measure the velocity of the atoms when they clash, and could we find their number and weight, multiplying the mass of each atom by the square of its velocity, and, adding all together, we should get a number representing the exact amount of heat developed by the union of the oxygen and carbon.

Thus far we have regarded the heat developed by the clashing of sensible masses and of atoms. Work is expended in giving motion to these atoms or masses, and heat is developed. But we reverse this process daily, and by the expenditure of heat execute work. We can raise a weight by heat; and in this agent we possess an enormous store of mechanical power. This pound of coal, which I hold in my hand, produces by its combination with oxygen an amount of heat which, if mechanically applied, would suffice to raise a weight of 100 lbs. to a height of 20 miles above the earth's surface. Conversely, 100 lbs. falling from a height of 20 miles, and striking against the earth, would generate an amount of heat equal to that developed by the combustion of a pound of coal. Wherever work is done by heat, heat disappears. A gun which fires a ball is less heated than one which fires blank cartridge. The quantity of heat communicated to the boiler of a working steam-engine is greater than which could be obtained from the re-condensation of the steam after it had done its work; and the amount of work performed is the exact equivalent of the amount of heat lost. Mr. Smyth informed us in his interesting discourse that we dig annually 84 millions of tons of coal from our pits. The amount of mechanical force represented by this quantity of coal seems perfectly fabulous. The combustion of a single pound of coal, supposing it to take place in a minute, would be equivalent to the work of 300 horses; and if we suppose 108 millions of horses working day and night with unimpaired strength, for a year, their united energies would enable them to perform an amount of work just equivalent to that which the annual produce of our coal-fields would be able to accomplish.

Comparing the energy of the force with which oxygen and carbon unite together, with ordinary gravity, the chemical affinity seems almost infinite. But let us give gravity fair play; let us permit it to act throughout its entire range. Place a body at such a distance from the earth that the attraction of the earth is barely sensible, and let it fall to the earth from this distance. It would reach the earth with a final velocity of 36,747 feet in a second; and on collision with the earth the body would generate about twice the amount of heat generated by the combustion of an equal weight of coal. We have stated that by falling through a space of 16 feet our lead bullet would be heated three-fifths of a degree; but a body falling from an infinite distance has already used up 1,299,999 parts out of 1,300,000 of the earth's pulling power, whence it has arrived within 16 feet of the surface; on this space only $\frac{1}{1300000}$ ths of the whole force is exerted.

Let us now turn our thoughts for a moment from the earth towards the sun. The researches of Sir John Herschel and M. Pouillet have informed us of the annual expenditure of the sun as regards heat; and by an easy calculation we ascertain the precise amount of the expenditure which falls to the share of our planet. Out of 2,300 million parts of light and heat the earth receives one. The whole heat emitted by the sun in a minute would be competent to boil 12,000 millions of cubic miles of ice-cold water. How is this enormous loss made good? Whence is the sun's heat derived, and by what means is it maintained? No combustion, no chemical affinity with which we are acquainted would be competent to produce the temperature of the sun's surface. Besides, were the sun a burning body merely, its light and heat would assuredly speedily come to an end. Supposing it to be a solid globe of coal, its combustion would only cover 4,600 years of expenditure. In this short time it would burn itself out. What agency then can produce the temperature and maintain the outlay? We have already regarded the case of a body falling from a great distance towards the earth, and found that the heat generated by its collision would be twice that produced by the combustion of an equal weight of coal. How much greater must be the heat developed by a body falling towards the sun! The maximum velocity with which a body can strike the earth is about 7 miles in a second; the maximum velocity with which it can strike the sun is 390 miles in a second. And as the heat developed by the collision is proportional to the square of the velocity destroyed, an asteroid falling into the sun with the above velocity would generate about 10,000 times the quantity of heat generated by the combustion of an asteroid of coal of the same weight. Have we any reason to believe that such bodies exist in space, and that they may be raining down upon the sun? The meteorites flashing through the air are small planetary bodies, drawn by the earth's attraction, and entering our atmosphere with planetary velocity. By friction against the air they are raised to incondescence and caused to emit light and heat. At certain seasons of the year they shower down upon us in great numbers. In Boston 240,000 of them were observed in nine hours. There is no reason to suppose that the planetary system is limited to "vast masses of enormous weight," there is every reason to believe that space is stocked with smaller masses, which obey the same laws as the larger ones. That lenticular envelope which surrounds the sun, and which is known to astronomers as the Zodiacal light, is probably a crowd of meteors; and moving as they do in a resisting medium they must continually approach the sun. Falling into it, they would be competent to produce the heat observed, and this would constitute a source from which the annual loss of heat would be made good. The sun, according to this hypothesis, would be continually growing larger; but how much larger? Were our moon to fall into the sun it would develope an amount of heat sufficient to cover one or two years' loss; and where our earth to fall into the sun a century's loss would be made good. Still our moon and our earth, if distributed over the surface of the sun, would utterly vanish from perception. Indeed, the quantity of matter competent to produce the necessary effect would, during the range of history, produce no appreciable augmentation in the sun's magnitude. The augmentation of the sun's attractive force would be more appreciable. However this hypothesis may fare as a representant of what is going on in nature, it certainly shows how a sun might be formed and maintained by the application of known thermo-dynamic principles.

Our earth moves in its orbit with a velocity of 68,040 miles an hour. Were this motion stopped, an amount of heat would be developed sufficient to raise the temperature of a globe of lead of the same size as the earth 384,000 degrees of the cen-

tigrade thermometer. It has been prophesied that "the elements shall melt with fervent heat." The earth's own motion embraces the conditions of fulfilment; stop that motion, and the greater part, if not the whole, of her mass would be reduced to vapour. If the earth fell into the sun, the amount of heat developed by the shock would be equal to that developed by the combustion of 6,435 earths of solid coal.

(To be concluded in our next.)

AUTUMNAL EXHIBITIONS IN BERLIN.

ALMOST all our national exhibitions take place in the spring. They are governed by the duration of the London season, after the close of which, about the end of July, exhibitions in London would find no spectators. The fashionable seasons of other capitals, however, occur at different periods. In Paris the season closes with the first five days in May. Then commences the "country-house season," as it is termed, *la saison des chateaux*. This is followed by the "season of watering-places," *la saison des eaux*. This closes at end of October. And in November and December Paris begins to be alive with the re-opening of its operas, and the production of new pieces at the national theatres. With the New Year begins the series of concerts, and then comes the Carnival, followed by the art exhibitions—the Parisian gaities terminating just when ours begin.

"The Season" in many of the German principalities is governed by that of the mineral baths, which, in most places, takes place in the autumn, though at some few of the baths the season closes as early as July or August; but, as a rule, the fashionable season in Northern Germany may be said to take place in the autumnal months, on account of the great influx of foreign visitors at that period. It is on this account that the Berlin Exhibition of Arts takes place in September. In accordance with this regulation, the *Gazette de Prusse* announces that all works intended for this year's exhibition must be sent in before the 16th August, and that the exhibition will definitively open on the 7th of September. English artists, intending to exhibit, should lose no time in obtaining information relative to the detailed regulations to be observed. And our autumnal tourists, who make their trip a northern one this year, should take note of the Exhibition of Berlin as a thing worth seeing during September and October. It is said that the forthcoming display will be of even more than its usual importance.

MINOTAUR TARGET TRIAL.

GREAT ARMSTRONG GUN BURST.

ON Monday last another of those experiments on naval armour which have so important a bearing on our national defences took place at Shoeburyness. There was the usual attendance of Lords of the Admiralty, members of the Iron Plate Committee, a number of naval and military officers, engineers, iron manufacturers, and shipbuilders, as well as several foreigners, including agents of the Danish Government. A more than usual interest was excited on this occasion by the double attraction of the proposed trial of the full powers of attack with the 150-pounder Armstrong smooth-bore gun, and of a supposed improved plan of defence, in the form of an armour-plated target, representing a section of the frigate Minotaur.

The vessels of this class, of which four are being constructed, are designed larger, more powerful, and more effectually protected, than the Warrior. Great pains were taken in the department of the Controllers of the Navy to render the armour plating more effective than that of the Warrior. No new plan was adopted—the same system of enormous plates, teak backing, and through-bolt fastenings, was adhered to but some of the ascertained defects of the Warrior plan were sought to be remedied by dispensing with tongueing and grooving the edges of the plates, reducing the thickness of the teak from eighteen to nine inches, and increasing that of the armour plates from four and a-half to five and a-half inches. These alterations, *without testing their efficiency by experiment*, appear to have given entire satisfaction to the Admiralty, since the construction of the ships of this new class of improved Warriors (as they were called) was commenced some months ago, and the armour plates were ordered, and the greater part of them, we believe, are manufactured, in full confidence, on the part of the authorities, of a complete success. It will be seen by the result of the trial that this expectation was lamentably disappointed. The alterations in a plan already known to be defective, instead of removing, increased its defects, and one is left to wonder at the rash confidence which sanctioned an expenditure of half a million on a doubtful plan, without trial, and after the warning of previous failure, for the Warrior target was anything but a success.

In order to make a fair comparison between the Warrior and Minotaur targets the same frame was used for both. The three 4½-inch plates to the right of the port were stripped off, and replaced by the same number of 5½-inch plates, on nine inches of teak planking, and fastened with through bolts. Another modification consisted of iron plates 10 inches wide and 1½ inch thick, let into the teak, and placed longitudinally at the back of the joints of the centre and top and bottom armour plates. In former experiments, these joints were found to be weak places, and it was thought that the longitudinal plates would support the edges, and impart strength to the structure; but a little reflection might have shown that these back supports affording a hard bearing (iron) to the edges only, and leaving the central parts resting on a comparatively soft material (wood), the armour plates would be more easily penetrated. The target was supposed to be further strengthened by covering the joints of the skin plates, longitudinally, with ⅝ plates 18 to 20 inches wide, let into the back of the teak, and bearing against the outside of the skin.

Four round shot were fired from the 150-pounder Armstrong gun.* The three first were cast-iron, weight 156 lbs.; the last wrought-iron, weight 162 lbs.; the charge in each case was 50 lbs. of powder; the range 200 yards. No. 1 struck the centre plate (which is 9 feet long and 3 feet 4 inches wide) about 2 feet from the port, midway between the top and bottom edges. It penetrated the armour plate, making a hole 12 inches in diameter, and crushing through the teak backing, burst the ship's skin plate open, making three large cracks, through which splinters of wood protruded behind, split one of the frames across, broke off the points and nuts of four armour plate bolts, and four or five wood bolts. Several bolts of the plate above were started by the shock.

No. 2 hit the top plate (which, as well as the bottom plate, is about 11 feet long, and 3 feet 4 inches wide) about 3 feet from the left end, and about the middle between the upper and lower edges. This shot made a hole 12 inches in diameter through the plate, and forced a way through the teak backing and skin plate. Large fragments of the armour plate, including the front piece bearing the mark of the shot, were found on the ground 10 or 12 yards behind the target, and 5 or 6 bolt ends and nuts were broken off. Shelf pieces and caulking plates intended to support the skin plates inside were ripped off at the line of rivets. Two frames were cracked.

No. 3 made a hole, of the same diameter as before, clean through the bottom plate, close to the upper edge, and equidistant from the butts. Large pieces of the shot and armour plate passed through the target; the cone of the shot imbedded in the portion of plate carried away at the moment of impact was picked up some yards in the rear. In addition to the hole through the armour plate, its upper edge was split longitudinally a length of 2 or 3 feet, showing the lamination of rolled iron. Two of the frames behind the skin were further damaged and broken in two, and several bolt ends and nuts broken off.

No. 4 struck the centre plate about 3 feet from the right end. This shot, being of wrought iron, did not break up like the cast iron shot, which invariably fly into fragments, leaving a cone in front, but it flattened and stuck fast in the armour plate, leaving one-third of its diameter outside. This effect arises from the ball squabbing out from its own force, and becoming too large to pass through the hole made at the moment of impact. The diameter of the protruding portion measured 13½ inches, that of the shot being 10 inches. The effect of this missile was more destructive than that of the cast iron shot. Keeping entire it does all its work in damaging the target—whilst the latter expend part of their force in destroying themselves. Large pieces of the armour plate were driven through the target, crushing the wood backing to shreds, bursting a great opening through the skin plates, and completely smashing two more frames.

The discharge of this shot brought the destructive action of the 150-pounder to a close, for this colossal 12 ton gun, about which there has been so much controversy, burst in firing the fourth round. The entire breech end, weighing about 17 cwt., was blown off and carried 50 yards behind. There were no splinters, and no person was injured; but that is not surprising, because previous to every discharge the artillery men gave the dangerous monster a wide berth, the gun being fired by a long lanyard pulled by a gunner who was safely ensconced.

There is no denying that the gun had the best of it in this encounter. The target was so fearfully mutilated, that if it had been a ship afloat, seeing the effect of only four shots, she would have been in as bad a predicament as a timber ship. The injury to the armour plates and to the skin and frame, great as it was, was not so disastrous as the destruction of the fastenings. Three-fourths of the bolts which held the plates were gone. Of thirteen bolts, with which the centre plate was secured, eleven were visibly broken, and probably the other two were also broken, although the heads or nuts had not come off. This damage to the fastenings arises from the plate, when struck, being bulged and driven into the wood backing, which affords no support, but yields to the blow; consequently, the butts buckle and start with a tremendous rebound from their bearings, tearing away the bolts. The three plates were dished—driven in at the centre, and curled up at the ends, one nine inches and the others six or seven inches off from the wood backing. The Duke of Somerset put his finger on the main defect when he said, "I have seen plates after a few shots fall bodily off the side of the vessel, which then was in a worse position than a wooden ship."

But these results, probably, are to be attributed more to the inefficiency of the system of armour plating than to the power of the guns. At all events, it is proved by this last experiment that however defective the armour plating of the Warrior was found to be, that of the Minotaur class is worse; and it is impossible the question can remain in its present state. Two 68-pounder round shot were afterwards fired separately at the bottom plate; they made deep indentations in the iron, but did not penetrate or damage the target.

It was remarked, as a singular exception to the effects of former target experiments, that the armour plates were not cracked at the bolt-holes. The explanation seems to be that the velocity and force of the projectile being so great as to penetrate the plates through and through, owing to the non-resistance of the wood backing, the shot did its work without causing the same amount of vibration as a shot at a lower velocity, on the same principle as a rifle ball will pass through a pane of glass without cracking it. In former experiments, heavy shot at low velocities, and

* The *Times* persists in calling this gun a 300-pounder. This is a misrepresentation. It is a smooth bore made to carry a spherical 10-inch shot, weighing 156 pounds. The pretence for calling it a 300-pounder is, that there was some talk about rifling the gun, and loading it with an elongated bolt of that weight; on the same supposition, a 68-pounder might be called a 136-pounder.

THE ARMSTRONG GUN.

FIG. 1.

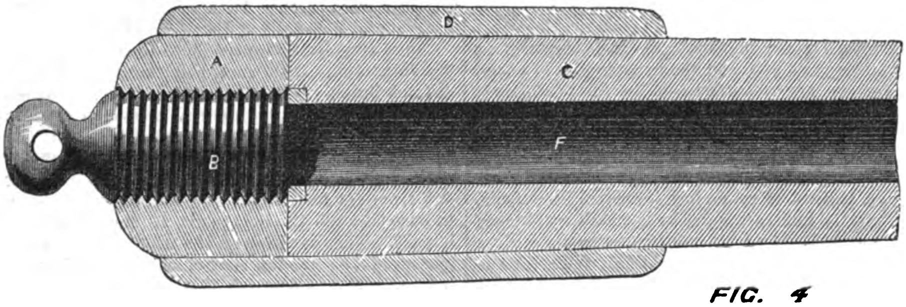


FIG. 2.

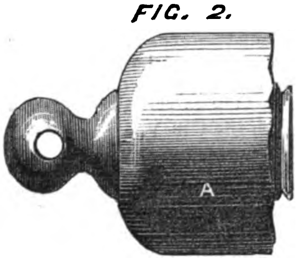


FIG. 3.

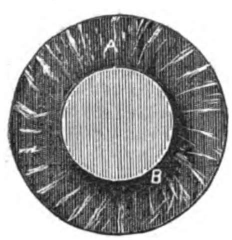
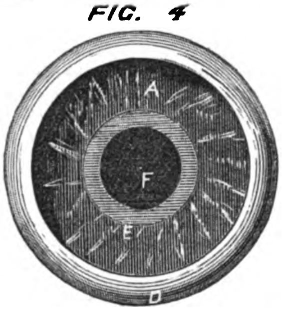


FIG. 4



shell which produced only slight indentations in the iron, caused extensive cracks at the bolt-holes.

We cannot close our report of this interesting trial of the power of artillery without putting our readers in possession, so far as we are able, of the precise nature and cause of the damage sustained by the great Armstrong gun. Having taken a prominent part in publishing what we believed to be a correct estimate of the defects of the system, we are anxious to establish the truth, and we hope, with the aid of the annexed diagrams (in which the same letters designate the same parts) to render a description of the present condition of the gun intelligible to our readers.

The manner of the accident, by disclosing two sectional views of the breech at the time of fracture, afforded a complete illustration of the internal construction of the gun, which, if we may judge from the observations of machanical engineers and ordnance constructors who examined the broken parts, was not previously understood by the scientific public.

Fig. 1 represents a longitudinal section before the accident occurred. The muzzle end is truncated in the drawing to save space in our columns. The barrel *C D* in its whole length from the breech to the muzzle suffered no damage. It remained in position on the carriage apparently without a flaw. The line of fracture is 1¾ inches from the inner surface of the breech-piece *B*, which is a solid cylinder 15 inches in length and 15 inches in diameter, forming an enormous screw, which fits into the worm cut into the outer cylindrical mass *A*, the two screwed up forming the breech-end of the gun, which is 30 inches in diameter, and weighs 16 or 17 cwt. Fig. 2 represents the breech separated from the gun, showing the end *B* of the breech-piece projecting 1¾ inches. Fig. 3 is a front view of the section at the line of fracture looking at the breech. Fig. 4 is a similar view looking into the barrel; *A* is the outer mass of the breech; *B* the breech-piece; *C* the coils forming the barrel; *D* the external coils shrunk over the former; *E* a copper disc, against which the outer edge of the face of the breech-piece was tightly screwed up to prevent the escape of gas in the rear; *F* is the bore. The copper disc and screw arrangement at the breech appears to have been the cause of the accident, and, in the opinion of engineers competent to judge, is looked upon as a mechanical blunder. The pressure and close-fitting of the edges of the breech-piece to the copper disc were not sufficient to prevent the escape of gas, which passed behind the disc; consequently, the effect of the explosive force on the breech was not limited to the surface area of the bore of the gun, which is 10 inches, but was extended to the area of the breech-piece, or 15 inches in diameter, an increase in the proportion of 225 to 100. The destructive effect of the enormous pressure was aided by the cut of the screw in the mass *A*, at the first thread of which the fracture took place, leaving 1¾ of the mass *A* in the barrel. The shear of the iron, 7½ inches thick all round, following the nick of the screw cut, is singularly clean and regular. The broken faces present a close granulated texture like cast steel, but the discolouration of the surface by the explosive gas rendered it difficult to form an opinion of the nature of the material.

The results of last Monday's experiments is a severe and double disappointment to the official authorities. The anticipated triumph of the great gun is annihilated at a blow. The theory of destructive capabilities of large guns on iron plates at long ranges is far from being confirmed in practice. If a 150-pounder on the Armstrong system, on which such implicit reliance was placed, bursts with the ordinary charge as a smooth-bore, how can it be expected to stand the immense increase of explosive force when rifled? and what chance does there seem to be that the 300, 600, and 1,000-pounders, on which the Defence Commissioners founded the conclusions of their report, will ever be made available? The wisdom of Parliament in putting an end to the Spithead Forts is demonstrated. On the other hand the terrible damage sustained by the Minotaur target places the Admiralty in the awkward predicament of having to alter the system of armour-plating, for which an enormous expenditure has been incurred, and probably has been thrown away. This comes of trying experiments on a plan after it has been adopted. It is the old story of the stable-door and the horse.

INSTITUTION OF CIVIL ENGINEERS.

THE council of the Institution of Civil Engineers have awarded the following premiums for papers read during the session 1861-62:—

1. A Telford medal, the Manby premium, in books, and a Stephenson prize of twenty-five guineas, to Charles Agustus Hartley, M. Inst. C. E., for his "Description of the Delta, and of the Works recently executed at the Sulina Mouth, of the Danube."

2. A Telford medal, and a Miller prize of fifteen guineas, to John Henry Muller (of the Hague), for his paper "On Reclaiming Land from Seas and Estuaries."

3. A Telford medal, and a Miller prize of fifteen guineas, to John Paton, M. Inst. C.E., for his paper "On the Sea Dykes of Schleswig and Holstein, and on Reclaiming Land from the Sea."

4. A Telford medal, to James Abernethy, M. Inst. C.E., for his "Description and Illustrations of the Works at the Ports of Swansea, Silloth, and Blyth."

5. A Telford medal, to John Bailey Denton, M. Inst. C.E., for his paper "On the Discharge from Underdrainage, and its effect on the Arterial Channels and Outfalls of the Country."

6. A Watt medal, to Joseph D'Aguilar Samuda, M. Inst. C.E., for his paper "On the Form and Materials for Iron-Plated Ships, and the Points Requiring attention in their Construction."

7. A council premium of books, to James Brunless, M. Inst. C.E., for his paper on "Railway Accidents—their causes and means of prevention."

8. A council premium of books, to Captain Douglas Galton, R.E., F.R.S., Assoc. Inst. C.E., for his paper on "Railway Accidents, showing the bearing which existing legislation has upon them."

9. A council premium of books, to Henry Charles Forde, M. Inst. C.E., for his paper on "The Malta and Alexandria Submarine Cable."

10. A council premium of books to Charles William Siemens, F.R.S., Inst. C.E., for his paper "On the Electrical Tests employed during the construction of the Malta and Alexandria Telegraph, and on insulatng and protecting Submarine Cables."

11. A council premium of books, to James Atkinson Longridge, M. Inst. C.E., for his paper on "The Hooghly and the Mutlah."

12. A council premium of Books to James Oldham, M. Inst. C.E., for his paper "On Reclaiming Land from Seas and Estuaries."

STEAM CULTIVATION.

THE application of steam-power to the processes of husbandry is no longer a question of doubt, as it was a few years since, but one of fact; and, so far at least as it has yet been put in practice, it is eminently successful. An interesting scene was to be witnessed at Farningham, on two days of this week, in the competition of several machines, on the rival systems of Smith, Howard, and Fowler. Some explanation of their different principals, and of other steam-cultivating inventions, which were not exhibited on this occasion, may here be given. The Royal Agricultural Society of England, while it had not deemed fit to offer any prizes for a regular match of the mechanical ploughmen, had liberally granted £600 or £700 for the expenses of their working exhibition. The system, however, of Lieutenant Halkett, which is the most elaborate of any, was debarred from this competition by its requiring the costly provision of laying down a set of rail upon the land. Mr. Fowler's twelve-horse-power self-propelling engine, with a four-furrow plough, for which may be substituted a grubbing or a scarifying implement when required, appeared to be a very efficient machine; but equal, if not greater execution, was done by one of Howard's stationary engines at work not far off, although deprived, by an accident disabling its fly-wheel, of a fifth part of its power. Another engine of Howard's worked a drill, by which sack after sack of grain was sown with wonderful rapidity. Meanwhile the powerful machine of Mr. Smith, which is presently to be described, was employed on a neighbouring hill in "smashing up" some heavy ground; the soil where Fowler's and Howard's were ploughing was almost as light and loose as sand. The decision of the judges, which is not yet announced can hardly go far to settle the practical question of using the steam-engine in agricultural operations; for machines are in existence, and others are now being constructed, on principals very different from those shown at Farningham; and the difficulties which have been experienced in em-

ploying steam labourers for the actual business of farming, except on a large scale, may be got over by some improved contrivance.

There is, indeed, good reason for thinking that the ultimate serviceableness of steam-power in husbandry will go far beyond the present limits of its application. In other arts, wherever it is introduced, without one exception it reigns paramount, having superseded every other power. Throughout the whole range of manufacturing industry, it has banished hand-labour in all the more onerous departments, confining it almost exclusively to those in which the exercise of mind is necessary. Thus, in the textile manufactures, steam-power does everything, from the preparation of the material to the perfecting of the fabric; the office of the operative being to watch the movements of the machinery, supply it with materials, regulate its speed, and perform other light operations requiring the use of the judgment. In the workshop of a machinist, likewise, steam-power is used for turning, cutting, filing, polishing, and fitting the different portions of the work in hand. What, then, is there in the nature of land to prevent a similar universal change from being effected by steam-power in agriculture? At present its use is limited in cultivation to the simple operation of ploughing, or otherwise breaking up the soil, whilst four out of five horses which were formerly required are still necessary to perform the other work of the farm. It is evident that steam may be made to do whatever is done by mere brute force.

The different modes of steam cultivation which have been actually put in operation may be divided into three distinct classes, namely, the traction system, the roundabout system (as it is quaintly termed), and the gudeway system.

The *traction* steam-plough was first invented by Boydell, who expended a good fortune upon it. This consisted of a locomotive steam-engine of 10 or 12 horse-power, to the wheels of which were attached "an endless railway," formed of a succession of strong flaps made of wood and iron, so fixed by one end as to fall under the wheel upon the ground as it progressed, and thus to prevent it from sinking into the soil. Three or four ploughs were attached by chains to the engine, which, when in motion, turned up the soil to the depth of from six to ten inches, the furrow-slice being nine or ten inches in width. Each plough required a man to guide it, as the ploughs were connected with the engine only by the chain, and totally unconnected with each other. It was found, however, that the weight of the engine—nine or ten tons—injured the land, and the number of men required to attend upon it rendered it an expensive plan; whilst a heavy shower of rain would stop the work altogether on a clay soil. At any rate, when other more eligible systems were introduced, Boydell gave up the attempt to establish this engine as a cultivating machine, and applied it to the purpose of a traction-engine for drawing heavy weights on the common roads. Boydell was followed by Romaine, who adopted the same system. His machine professes to perform the operation of digging the soil; but the enormous weight of the whole apparatus—no less than fifteen tons,—while it does not carry its own railway like Boydell's, precludes its use on a wet clay soil. Even upon a second year's clover lay, it will sink an inch into the soil; what, then, must it do on a fallow saturated with rain?

The second or "round-about" system includes several different forms, namely, Smith's, Howard's, (which is a modification of Smith's), Fowler's, and another invented by a Jersey farmer, which, as it has not been tried in public, we need not describe. Smith's system is this:—At one corner of a field is placed the steam engine and the windlass or drum, for paying out and receiving the endless rope. On a line with the engine, at or towards the further part of the field, is an *anchor* with a pulley; at the opposite corner to this is another anchor and pulley, and at the third corner another; the three anchors, with the engine, forming a square, about which the endless rope is passed, being wound round the windlass in order to its being acted upon by the steam power. Attached to the rope at the farther end of the square is the *cultivator*, consisting of a strong frame with five strong tines, with broad shares, so placed as that they stir the whole of the soil in their progress. The steam power works the rope by means of the windlass, and draws the cultivator through the soil to the opposite corner, where it is turned round and drawn back again, and so on till the whole square of land is "smashed up," as Mr. Smith expresses it. It is necessary in taking fresh ground to move the anchors forward at every bout. The quantity of land cultivated per day is from four to seven acres, at an expense of from 3s. 6d. to 6s. 6d. per acre.

Howard's system is a modification of Smith's; the improvement he has effected consisting in the working machine being a balance plough or cultivator, with the ploughs or tines pointing in opposite directions, which precludes the necessity of turning round at the end of the furrow, as is the case with Smith's. Some minor improvements have also been made, which it is unnecessary to point out.

Fowler's system has hitherto maintained an ascendancy over every other, and not only gained the prize of £500 from the Royal Agricultural Society, but also the first prizes at almost all the agricultural shows throughout the kingdom, and in France and Belgium. A steam-engine, with a windlass attached, is placed at the corner of a field. Opposite to it, on the other side of the field, is a machine called an anchor, very heavy, with iron wheels, sharpened at the periphery, so as to enter and retain a strong hold of the ground, to stand against the strain of the rope and the ploughs. A large pulley is fixed on this machine, over which the endless rope is passed, and also wound round the windlass attached to the steam-engine. The frame which bears the ploughs, four in number at each end, is balanced in the centre, being formed to an obtuse angle. The ploughs point four each way, so that, when those at one end are in the ground, the others are up in the air. The machine, being made fast to the rope, is drawn through the soil; and when it has arrived at the headland, where the anchor is fixed, the ploughs are lifted out of the ground, and those at the other end take their turn of the work. At each bout, it is necessary for the engine and the anchor to advance a step along the headland, to allow fresh ground for the ploughs. By this means from five to eight acres may be ploughed per day of ten hours, to the depth of from six to nine or more inches, if necessary, at an expense of from 5s. to 8s. or 9s. per acre.

We come next to the Halkett, or guideway system, which differs from all others, and which professes, when fully carried out, to perform every operation of husbandry, from the ploughing of the land to the harvesting of the crop, with the same machine. There are only two forms in which the *guideway* system has appeared; that of Mr. Halkett, the inventor, and that of Mr. Grafton, which is a modification of the other. We may give a brief description of Mr. Halkett's plan.

The guideway is formed by laying down the whole of the land with permanent rails, similar to those of the common railway, only with fifty feet or more distance between them. The rails reach across the field, and at one of the headlands rails are laid down at right angles to the working ones, and low enough for the working platform to run upon a shunting apparatus, by which it may be moved to a fresh set of rails, or to another field, or taken home, as may be desired.

The working platform or machine consists of a strong framework of timber and iron, extending across the intervals and resting upon the rails at each end, with eight low wheels. This machine is strongly braced together, so as to bear any strain that may be put upon it in cultivating to any required depth. Mr. Halkett, in fact, has cultivated to the depth of 25 inches. At each end of the platform is fixed a small steam-engine, say of four or five horse power, geared together by an intermediate shaft, so as to act simultaneously upon the wheels, which are driving as well as bearing ones. The engines are firmly fixed to the platform, and the power is communicated to the wheels by the same machinery of cog-wheels, pinions, and rods, as in other cases.

The implements of husbandry of any kind may be attached to the under part of the platform, which can be raised or depressed according to the work required. As many as twelve ploughs, or even more, may be worked at once by this means; but double the number worked at once are required, so that half are lifted whilst the other half are at work. When the whole space between one set of rails is ploughed or otherwise tilled, the platform is run upon the cross-rails and shunted to the next set; and so on, till the whole field is finished.

On Mr. Halkett's own land at Wandsworth, various agricultural operations were successfully performed by this machinery—namely, ploughing, sub-soiling, harrowing, rolling, clod-crushing, drilling seed (either dry or with liquid manure), hoeing, scarifying, watering crops (either on or below the surface), cleaning and comminuting the soil with the Norwegian harrow, carting and distributing farm-yard or artificial manure, reaping, mowing, and carting crops of corn, roots, and hay. All these different processes were wholly performed without the intervention of horse-power or of hand labour, except where the exercise of *mind* was required. There was, therefore, no pressure on the land of the foot of man or beast, or of wheel carriages, except in going over it for such purposes as pulling up roots, making hay, and tying up sheaves of corn.

The manifest advantages attending this system are,—precision of operation, economy of time and labour, concentration of power, perfection of work, and universality of operation. When once the implement, of what ever kind, is fixed to the machine, it cannot deviate from the direct line, so that in hoeing, for instance, the hoes may be set to cut within an inch of a row of plants, which they will never touch, because the seed, having been drilled by the machine, lies in a perfectly straight line parallel with the rails, which keep the hoes in the same direction. The machine, too, can, on a stress of work, be employed day and night in ploughing or any other operation, which is an important advantage, realised in every other industrial employment, but hitherto rarely taken into account in agriculture. To this system the only objection to it is the expense (£20 per acre) which at present appears to bar its adoption.

A new cultivating machine, however, on the locomotive principle, is now being constructed by Mr. Bray, the inventor of the well-known traction engine used upon the high roads. If Bray's contrivance for applying steam power to agriculture does what it promises, it will be a most valuable boon to the occupiers of moderate-sized farms. His engine, about six feet wide and eight long, is compact in form, and weighs, together with the apparatus for ploughing, not more than about three tons. This will do the work of eight horses, and never tire. It does not require to have rails laid for it. It can be worked by two men and a boy with ease, and they may ride afield on the top of the frames, to which the implements are fixed, on either side of the axle. Though it will turn with the greatest facility, it need not, in ploughing, be turned round at the end of the furrow, as it will plough backwards and forwards. The apparatus and engine described will plough three furrows at once, and may be adjusted to cut them of such depth and width as the nature of the soil requires. The same engine can be put to draw a loaded waggon, to thrash corn, to work a hose for distributing liquid manure, and to do many other things for the farmer, who may sell two team of horses and save their keep, when he has secured the services of such a powerful labourer as this. From its lightness, it will avoid the great objection to Boydell's steam-ploughing machine on the traction system.—*London Review.*

KNOWELDEN'S PATENT PUMPS.

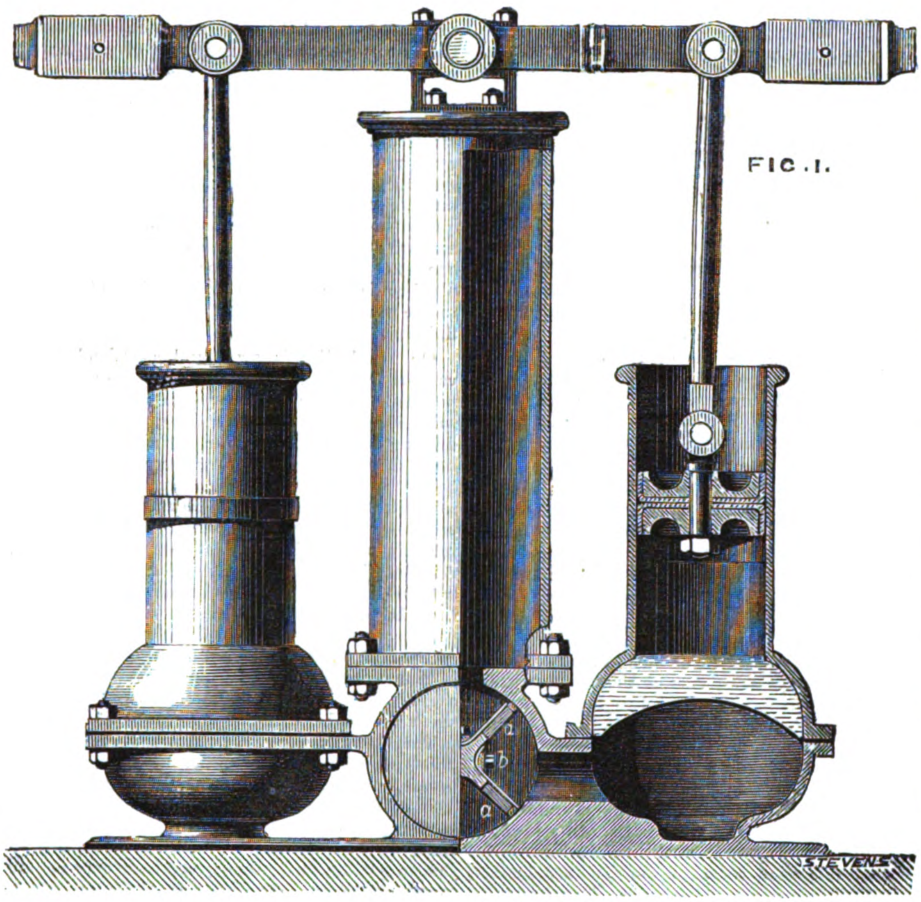


FIG. 1.

MR. J. KNOWELDEN, of Southwark, has just patented an improvement in pumps. These improvements are based upon an invention patented in 1859, and illustrated in our columns 20 Jan., 1860. The first part of this invention refers to the valve chamber and valves; it consists in forming the chamber circular, and in fitting the valves to feathers on a circular plug. The patentee connects a handle to the outside of the plug, whereby the same may be withdrawn in case of need, and whereby the action of the pumps in connection with the valves may be reversed, that is, the pipe which acted as a suction pipe may be made to act as a force or delivery pipe, and that which acted as a force may be converted into a suction pipe. Fig. 1 of the accompanying engravings is a side elevation partly in section; and Fig. 2, a detached view of one of the plugs of a pump fitted with valves; *a a* are the valves fitted in a circular box or chamber *b*; *c c* are the valve feathers. The valve rod extends outside the box, and is fitted with a handle whereby the position of the valves may be altered and the action of the pump consequently reversed. No fastening being required to hold the valves, they may be withdrawn, any impediment to their action removed, and they may be immediately replaced in the valve chamber. Water, which is alternately drawn into the compartments, and through the apertures formed in the lower part of the valves, is forced through the action of the pistons and diaphragms into the chamber *g* through the apertures in the upper part of the valves.

The invention further consists in making the pumps for donkey engines double-acting. The plunger is formed with a space in the bottom, to which a valve is fitted; and on the bottom of the plunger a piston is secured of the same diameter as the bore of the barrel. A valve may or may not be in the bottom of the barrel.

FIG. 2.

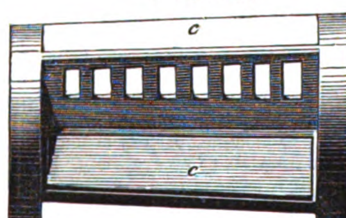
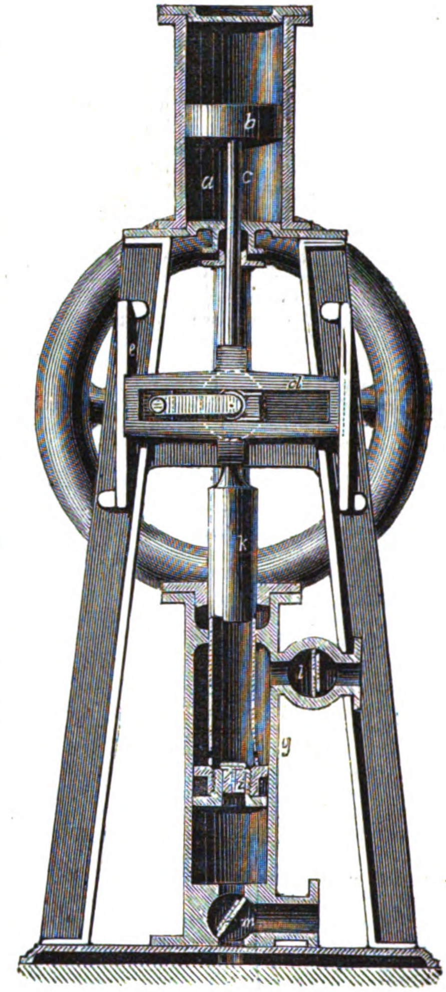


Fig. 3 is a section of so much of a donkey engine as will be necessary to show the manner in which pumps are rendered double-acting; *a* is the steam cylinder, *b* is its piston, and *c* the piston-rod united to the cross-head *d*, which is free to slide up and down in guides *e e*; *f* is the piston in the pump *g*; a space is formed in the lower part of the piston for holding a valve at its upper part; *k* is the plunger, having an annular space between it and the pump barrel; *l* is a valve at the top, and *m* is a valve at the bottom of the pump, the former in the outlet pipe, and the latter in the inlet. Supposing water to be drawn into the pump by the pipe *m*, and the piston to be at the top of its stroke, then on its return stroke half the water thus drawn in will be delivered through the outlet pipe, and on the up stroke the other half will be delivered through the same pipe, and so on.

The invention also relates to constructing pumps for working presses and other purposes, to be worked by a steam cylinder or otherwise. The pumps are placed in direct connection with the piston-rod, and the valve motion is so constructed that the engine shall be stopped when the pressure exceeds the working pressure of the pumps. The pumps are made double-acting by fitting them with four valves; the barrel of the pump is bored

FIG. 3.



and fitted with a piston, which is fitted on the end of a plunger of so much smaller diameter than the barrel as will leave sufficient space to form the pressure side of the pump.

Fig. 4 is a side elevation partly in section, and Fig. 5 is an end view of a pump for working presses; *a* is the cylinder, *b* the piston, and *c* the piston-rod which also forms the plunger to the pump *d*. The valves of the cylinder are worked by the small cylinder *e*, which carries a lever *f* extending down to the piston-rod *c* below; stops are placed on the piston-rod. At each stroke of the piston these stops come against the lever *f*, and thereby open and close the ports in the steam cylinder; *h h* are valves—one is in communication with the pressure side, and the other with the speed side *k* of the piston. When the valve rises by the pressure exerted upon it to near the upper end of the spring on the valve, by means of levers it closes the cock by which steam is admitted to the cylinder and stops the motion.

In working pumps for extinguishing fires and other purposes, they are made with a variable stroke, in order to their being effectually worked under high and low pressure.

The following gentlemen have had medals awarded to them for papers read before the Society of Arts:—Dr. F. Crace Calvert, F.R.S., for his paper "On Improvements and Progress in Dyeing and Calico-Printing since 1851." The Society's Silver Medal. E. C. C. Stanford, for his paper "On the Economic Uses of Seaweed." The Society's Silver Medal. James Morris, for his paper "On Mauritius: its Commercial and Social Bearings." The Society's Silver Medal.

KNOWELDEN'S PATENT PUMPS.

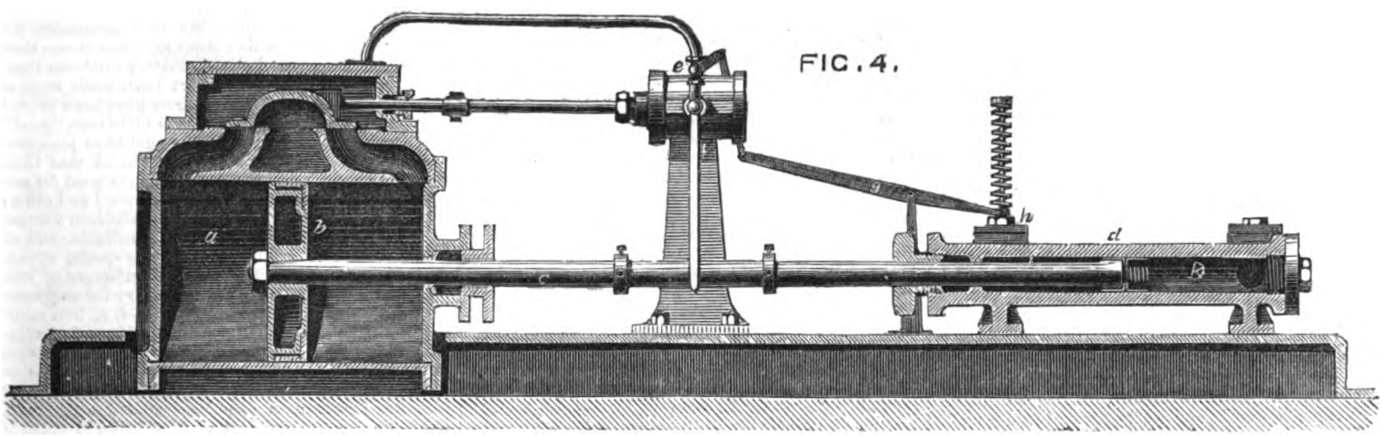
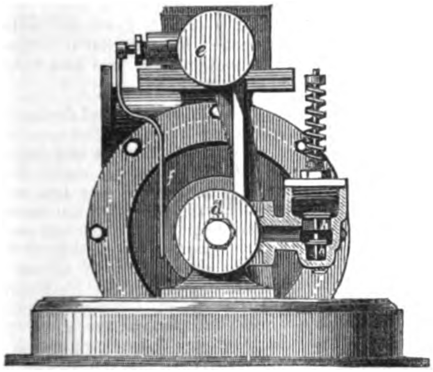


FIG. 5.



ON THE CLEANING AND PRESERVATION OF ENGRAVINGS.

AUGUSTUS A. HAYES, M.D., State Assayer of Massachusetts, says in the *Scientific American*:—

The frequent inquiries addressed to me by those who possess valuable engravings—which have become damaged through accident, or exposure—respecting a mode I adopted successfully for restoring some very fine ones, induce me to publish a general process applicable to the largest number of cases.

Any one who will incur the trouble of looking up in the older print shops, and depositories in residences in this country, will find abundance of defaced engravings of rare merit—the works of the best masters rejected, which can be restored easily to quite their former degree of freshness and beauty. All who have studied the better efforts of the old artists, in giving permanency to their conceptions in this department of art, assign to it a very high place, and it may be suggested that a higher cultivation and enjoyment of design and execution, in so far as the influences of light are concerned, may be gained from careful observation of engravings, than can result from time bestowed on paintings, which often command public admiration, or are the so-called gems of an exhibition.

In commencing to restore an engraving some attention must be given to the kind of injury it has suffered. A general brown colour, more or less deep, resulting from atmospheric action only, is the least possible change. Spots and stains caused by ink, coloured fluids, oil or insects, must be first treated and all pencil marks removed by india-rubber or bread crumbs. A fluid acid, obtained by dissolving one ounce of crystals of oxalic acid in one-fourth of a pint of warm water, may be used for application to all stains, and the paper should be wet with it thoroughly where spots of any kind exist. Excepting in a few cases, this acid will not cause the removal of stains immediately, but generally it combines with the bases of them, and they are removed by subsequent steps; the thorough wetting should be done a few hours before proceeding to clean the engraving.

To facilitate handling and for the protection of the edges of the paper, a piece of millinet, or the stiff open fabric formerly sold for ladies' skirts, should be roughly sewed around one stick at each end, so as to form an apron, like a chart attached to two rollers, the cloth of which must be an inch larger than the largest print to be handled. From one to ten prints of even large size may be cleaned at one time, after they have been wet on their spotted parts with the acid, and evenly spread on the apron, so as to allow of the immersion of the whole in water. A tub of the ordinary size will allow prints of considerable surface to become immersed, but the most desirable resort is a common bathing vessel, so nearly filled with warm water that the bent paper supported by the open texture can rest on the bottom and sides, where it should be allowed to remain with occasional raising of it, and moving it by means of the stick handles, from twelve to twenty-four hours.

On the first trial a degree of alarm will be felt in the case of a highly-prized favourite, at this seemingly careless treatment; but it must be borne in mind that paper is a firmly felted mass of short fibres which may be soaked in various fluids for weeks and resist all diluted acids and most chemical agents for a long time wet, if not exposed to mechanical abrasion by touch or rapid motion. The strong paper of engravings absorbs much air, which resists the penetration of the water, and motion is necessay to remove this as well as to allow the coloured solutions formed to pass away. This motion may be given by holding the supporting sticks and passing the mass from end to end of the bath, or slowly up and quickly down, enabling the sheets to become separated momentarily. Discoloured water may be drawn off, the apron and contents resting on the bottom and sides, and fresh water be slowly admitted to replace it. Cold water can be substituted for warm, longer time being allowed for its action. When the prints no longer add colour to the water after being agitated, the water must be withdrawn and replaced by such a portion as will barely cover the paper. Half a pound of bleaching powder (chloride of lime) mixed to a paste first in cold water, and then added to two quarts of cold water and well stirred from time to time for six hours, will afford a nearly clear fluid resting on a white deposit in the earthenware vessel. A portion of the clear part of this fluid must be added to the water in the bath, until both taste and odour denote the presence of chlorine in the water. Motion being given to the paper the bleaching effect of chlorine will be preceived, or its odour in the water will have been lost; when more must be added so that the odour or taste of chlorine must be present in the water two or three hours.

The action of the chlorine on the parts previously wet with the acid will remove nearly every kind of discoloration, while the brown hue of the paper giving place to perfect whiteness, the light and shadows of the engraving become of their original perfectness, and the picture will be as distinct as when it was first impressed. It has happened, in a few trials, when the prints were long stained they did not yield to the weak chlorine water, that resort was to have a little mineral acid to develop free chlorine in the bath. One ounce of muriatic acid was added to one pint of cold water, and the weak acid thus formed mixed in the water of the bath, soon caused the bleaching of every fibre in the paper.

After the bleaching the water must be drawn off, the paper drained, fresh clear water admitted, and the paper moved through the water to thoroughly wash away all adhering chlorine. Several quantities of water may be used, the paper being each time drained; and finally the whole mass, raised by the handles, may be placed on a clean white wood table or board to drain. If a number of prints have been treated, the wet mass may be placed in a warm room, or air may be admitted, and as the one on the top of the pile becomes more dry than the rest, it may be removed to any support and left to dry. In hastening the drying I have extended ordinary bed sheets and spread the wet prints singly on these; slow drying rendering any pressing unnecessary.

Those having the usual presses might prefer to press the still damp sheets, and where only two or three prints are the subjects of trial the substitution of other vessels and ready appliances will occur to any one.

This discription is given in detail purposely, although unnecessary, so far as the process is concerned, because I wish to impress on the mind of any one who possesses an injured engraving, that it can be restored to its original value without the expenditure of much attention; and it must not be the conclusion, from reading this process, that great care is required, for time is insisted on rather than attention. The few dispositions being made, not the slightest care need be given to the matter; if the bath can be spared, the odd minutes of a week will enable one to restore dozens of specimens and give permanency to their beauties.

INTERNATIONAL EXHIBITION.

CLASS I.

IT is announced in the Official Catalogue that Class I. embraces "mining, quarrying, metallurgy, and mineral products." These products consist essentially of materials of construction, such as building-stones, slates, marbles, clays, &c.—of substances employed as fuel or for the production of light, such as peat, coal, and mineral oils,—and of ores yielding metals. The official classification is not strictly scientific, for, obviously, ores should precede metallurgy, which is the art of extracting metals from their ores, and adapting them for immediate use by the various workers in metals. But it is not material in what order the divisions of this great class are considered, and we shall begin with metallurgy. However,

before preceeding, we feel constrained to offer a few remarks on the treatment which Class I. of the British Department has received at the hands of Her Majesty's Commissioners. It is certain that great Britain has mainly derived her wealth from her vast subterranean treasury of coal and iron ore; and in no other part of the world are such prodigious amounts of coal raised and iron produced. The smelting of copper, lead, tin, and silver is also conducted on a very extensive scale in this country. It might, therefore, have been anticipated that Class I. would at least have been respectably accommodated; but, we regret to add, the reverse is the fact. Places of honour in the most conspicuous part of the building have been assigned in some instances to unsightly agglomerations of comparative trash, while the true and substantial representatives of British power and wealth have, for the most part, been doomed to a narrow passage leading to an out-house! The arrangement, moreover, of this class is sadly defective; but this, no doubt, is to be attributed to the limited space at the disposal of the superintendent. The classification, also, is in some respects unintelligible. Thus, the production of steel is essentially a metallurgical operation, and, therefore, belongs to Class I.; yet Krupp, Bessemer, and others, are excluded from it.

The metal which we propose first to consider is iron. But what is iron? This is a question which few persons would hesitate to answer; yet it is one which few could answer properly. The most familiar things are often the least understood, and of these, iron is certainly one. Pure iron is almost unknown, and, probably, not half-a-dozen men now living have ever seen it. What we call iron is the metal combined or associated with other elements, which, though present only in small quantity, may, according to their number and proportion, communicate to it widely different properties. These elements are chiefly carbon, silicon, sulphur, and phosphorus; but the most important is carbon. It is a simple variation in the proportion of carbon, within the limit of about five per cent., which causes the metal to appear in the three well-known states of wrought iron, steel, and cast-iron. As the proportion of carbon increases, the metal passes insensibly through these successive stages. We should, however, remark that it has recently been urged that another element, nitrogen, is an essential constituent of steel; but this theory has been hotly disputed last year in the French Academy. We have maturely weighed the evidence advanced on both sides, and have come to that conclusion that nitrogen is not essential to, but is often present in steel, and may sensibly affect its qualities. With regard to the other three of the four elements above mentioned, it suffices to state, that sulphur is the most frequent cause of *red-shortness*, and phosphorus of *cold-shortness* in wrought-iron. Now, when we reflect that one part in a thousand of any one of these elements will produce a decided effect on the quality of the iron, either separately or combined; and, when we further reflect that the proportion, in which each may be present is subject to considerable variation, we may readily conceive how great must be the diversity in quality of the iron, steel and pig iron, which we meet with in commerce. Then, again, in the case of wrought iron and steel the quality of the metal may be greatly modified by the mechanical treatment which it has received; and in the case of pig iron by the conditions under which solidification after fusion has occurred. It is a remarkable fact that, so far as our knowledge extends, iron is the only metal which is capable of acquiring such varied and useful properties by the operation of such simple and apparently trivial causes as those which we have just considered. One metal is thus made to act the part of several. The defective state of our knowledge of the chemistry of iron is the opprobrium of modern chemists. A thousand problems of the highest interest, relating to this all-important metal, await investigation; and we affirm, without fear of contradiction, that there is no metal of which the *science*, properly so-called, is less understood.

In the British Department there is no general collection of British iron ores such as Mr. S. H. Blackwell, of Dudley, presented in the Great Exhibition of 1851. That remarkable and instructive collection required for its formation not only extensive knowledge, but considerable personal devotion; and we doubt whether the valuable services which Mr. Blackwell then conferred on his country have ever been duly appreciated. It is preserved in the Museum of Practical Geology, where, unfortunately it is only dimly visible. But, while there is no general collection, there are numerous and excellent illustrations of the iron ores of particular districts, of which many are exhibited in juxta-position with the products derived from them. The red hæmatites, or, as they are technically termed, the "red ores" of Cumberland and Lancashire are well represented. There are two distinct varieties of these important ores—the hard and the soft. The latter are the most prized, as the former yield pig iron rich in silicon, which wastes considerably in puddling. It is generally admitted that iron derived exclusively from hæmatite ores is more or less red-short, but no satisfactory cause has yet been assigned for the fact. There are specimens of brown hæmatite from the Forest of Dean; and of these we would direct attention to the fine mass of "Black brush" ore, No. 76, which is interesting from the circumstance that it represents, as we are informed, a conquest of no ordinary kind over mining difficulties arising from water. Brown iron ore occurs in various localities in Great Britain, among which we may mention Cornwall, Devonshire, South Wales, and North Staffordshire. One of the best and purest varieties we have ever seen is the Frog-hall ore, from the last-named district.

The Ebbw Vale Iron Company displays fine specimens of sparry iron ore, or spathose carbonate of iron, from the Brendon-hills, Somersetshire; and the Weardale Company large masses of the same kind of ore from their mines in Cumberland. One peculiarity of this beautiful ore is, that it contains a large proportion of carbonate of manganese; it is exclusively this ore which furnishes the variety of pig-iron known as "Spiegeleisen," so called from the large, brilliant, mirror-like planes, which appear on its fractured surface. This remarkable variety of pig-iron is in special request for steel making, and magnificent specimens of it will be found in the Zollverein Department. Next in order follow the impure and earthy carbonates of iron, known as clay or argillaceous iron ores. It is this class of ores which has hitherto constituted the chief part of the mineral wealth of England. They occur abundantly and with great regularity in our coal measures in Yorkshire, Derbyshire, Staffordshire, Shropshire, and Wales. They are not confined to these measures, and are met with in various geological formations, even as high as the Tertiaries. When clay-iron ores contain much coaly matter they are termed "black band" ores, and it is these ores which have mainly created the wealth of the Scotch ironmasters. The late Mr. Mushet first discovered their value about the beginning of the present century. The Scottish ironmasters exhibit a remarkably fine and instructive series of these ores, No. 318. The "black band" is not confined to Scotland, but occurs also in Wales and North Staffordshire. A large mass from the well-known bed termed "Red Mine," in the last-mentioned district, is shown in No. 125. Specimens of various clay-iron ores will be found accompanying several of the collections of iron, but among them there is nothing to demand particular notice, except, perhaps, the utter worthlessness of some, if really intended as practical illustrations.

The vast deposits of iron ore occurring in the lias of Yorkshire is well illustrated by large and characteristic specimens. The discovery of this ore is of recent date, and, if we mistake not, Messrs. Bolckow and Vaughan were the first to recognize its importance, about the year 1847. They speedily erected blast-furnaces, and other ironmasters were not slow to follow their example; and now North Yorkshire has become one of the largest iron-producing districts of Great Britain. The ore in some localities is marvellously abundant, and can be raised at a very small cost. It is smelted with coke obtained from Durham, and, notwithstanding, the forge-pigs made from it can be sold with profit at £2 7s. per ton. We have heard some of the great Welsh ironmasters, after a visit to Cleveland, express considerable apprehension concerning their fate. The ore has a dark greenish, or bluish gray colour, and consists essentially of carbonate, in admixture with some silicate, of iron. Happily, some of the older iron-making districts can yet maintain a successful competition with the furnaces of Cleveland and the vicinity as to the quality of iron. A large block of ore from Rosedale, in the north court of the Eastern Annex, is well deserving of inspection. This variety of ore is magnetic.

It is only during the last twelve years that the extensive deposits of oolitic ores in Northamptonshire have been developed, chiefly through the instrumentality of Mr. S. H. Blackwell, who exhibited a few specimens of them in his collection at the last Exhibition. They are sufficiently represented in the present Exhibition. They consist for the most part of earthy brown hæmatite, and vary much in composition. They not unfrequently contain much phosphoric acid, and in that case yield pig iron, rich in phosphorus, which is unsuitable for many purposes, though it may be well adapted for castings in which strength is not required. These ores, which can be raised at a low price, have been largely consumed in certain well-known iron-making districts, and have assuredly not contributed to maintain, much less to enhance, the high reputation for good quality of iron which these localities at one time deserved. We do not indiscriminately condemn these ores; but we venture to assert that, while some of them may be tolerably good, others have been proved to be decidedly bad. We use these adjectives, "good" and "bad," with reference to the quality of iron produced, and it is necessary to bear in mind that their meaning is only relative. Iron which is good for one purpose is bad for another; but engineers and others are apt to employ these terms in too absolute a sense, and pronounce all iron good which is suitable, and all iron bad which is unsuitable, for some special object. A word on specifications for the manufacture of iron may here be in season. It is customary for engineers to prescribe that "mine iron" only—*i. e.*, iron made entirely from ores—shall be employed, to the exclusion of the so-called "cinder iron." We have seen many specifications, and we do not remember one in which this proviso has not been inserted; and there now lies before us a recent specification for rails, issued by one of our largest companies, in which is the following clause:—"The puddled bars to be made from mine iron only, without any admixture whatever of cinder iron" (Feb. 24, 1860). Now, it is certain that ores might be selected which would yield iron far inferior in quality even to the worst cinder iron, and we would therefore suggest that it is expedient to enumerate in specifications the ores which may and may not be employed.

Iron ore is obtained from the green sand formation in Wiltshire, where it is smelted. The furnaces are of recent construction. We have heard it maintained by a practical ironmaster of great experience that iron may be made in this district at a very low cost. The ore consists essentially of earthy brown hæmatite, and contains a large amount of siliceous sand, which would certainly not improve the quality of the pig-iron produced, unless the presence of silicon be regarded as advantageous! A neat and instructive series of specimens of the ore and furnace products, accompanied by a sectional plan of the workings, is exhibited by the Westbury Iron Company, No. 130.

It must not be supposed that we have passed in review all our workable iron ores. Extensive beds of clay-iron ore occur in Sussex, which in former times was one of the chief iron-making districts of this country. Our tertiary beds also contain clay-iron ore; and large quantities of this ore have been dredged up by fishermen off the coast of the Isle of Wight, and shipped to Cardiff, where it was sold at 10s. per ton in 1859. Ireland would be able to supply a large amount of iron ore if the expense of inland carriage were not, as at present, an insuperable obstacle to its transport. The conditions under which the smelting and manufacture of iron are now conducted in this country have been greatly modified of late by increased facilities of conveyance both by land and sea. Iron ores have been extensively carried from one part of the kingdom to the other, and have even been largely imported from the north-west coast of Spain. The manager of one of the greatest ironworks in South Wales recently informed us that they could procure good ore from Spain more cheaply than from a neighbouring county in England. One result of this interchange of ores has been in some localities to deteriorate, and in others to improve, the quality of the iron produced. In certain districts which had at one time a high reputation for quality, good ore has been purposely adulterated with bad on account of its cheapness, in the hope of competing successfully with other districts which have the power of making cheap, though not good iron. We have reason to know that not a few of our ironmasters now admit that, in some instances at least, this policy has proved a commercial blunder. Well-established reputations have been too hastily sacrificed, which it will require many years to restore. Yet some ironmasters have set to work in right earnest to amend their course, and we earnestly wish them success. The ironmaster may learn much from the present Exhibition. Ores are brought together from all parts of the world, and exhibited in association with the products which they furnish. A means of comparison is thus afforded which, we believe, is in the highest degree advantageous to all, whether British or foreign, who are engaged in the smelting or manufacture of iron. The public also may learn much by a careful inspection of the objects shown in Class I., and in our future communications we shall direct attention to every article of particular interest.

TO CORRESPONDENTS.

J. H. J., O. D., J. R., Capt. H., J. B., F. S., English Calefornian Mechanic, J. B., H. R. D., W. W., J. B., W. A., J. P., J. H., R. D. H.

Correspondence.

[We do not hold ourselves responsible for the statements of our Correspondents.]

THE IDENTITY OF PERCUSSION FORCE AND MOMENTUM.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—It would be well to understand each other upon the above subject. Those of your readers who have not Bourne's book upon the "Screw Propeller" may be glad to see his explanation of the matter, which, I believe, is generally accepted.

"Mechanical power is pressure acting through space; and the amount of mechanical power developed by any combination is measurable by the amount of the pressure, multiplied by the amount of space through which the pressure acts. A pressure of 10 lbs., acting through a space of 1 foot, represents the same amount of mechanical power as a pressure of 1 lb. acting through a space of 10 feet; and 10 lbs. gravitating through 1 foot, or 1 lb. gravitating through 10 feet, represents ten times the amount of mechanical power due to the gravitation of 1 lb. through 1 foot. In the same way, 1,000 lbs. gravitating through 1 foot is equivalent to 1 lb. gravitating through 1,000 feet; and, in general terms, the weight or pressure multiplied by the space through which it acts represents the power universally. If, therefore, a body falls freely through space by the operation of gravity, since it parts with none of its power during its descent, the whole power must be accumulated in the falling body in the shape of momentum, and, at the instant of reaching the ground, the body must have such an amount of mechanical power stored up in it as would suffice to carry it up again to the position from which it fell, if the power were directed to the accomplishment of that object. The amount of mechanical power, therefore, in any moving body is measurable by the weight of the body, multiplied by the space through which it must have fallen by gravity, to acquire the velocity it possesses; and this fundamental law, if distinctly apprehended, and kept constantly in recollection, will ensure exemption from the fallacies which prevail so generally among English authors in reference to such subjects. In Newton's 'Second Law of Motion,' it is maintained that 'the change or alteration of motion produced in a body by the action of any external force is always proportional to that force,' whence it is inferred that to produce twice the quantity of motion in a body will require just twice the power; and this is the doctrine maintained by Robinson in his 'Mechanical Philosophy,' and by Hutton, Gregory, and most other English authors who have undertaken to illustrate such questions. Nevertheless, there is no doubt whatever that the doctrine, though resting on the authority of Newton, is altogether erroneous, as was shown by Leibnitz at the time of its promulgation, and subsequently by Smeaton, who, by a series of carefully executed experiments, proved very clearly that it required four times the amount of mechanical power to double the velocity of a moving body that was necessary to put it into motion at first, and, consequently, that the momentum of moving bodies of the same weight varies as the squares of their respective velocities. The soundness of this conclusion is made manifest by a reference to the law of falling bodies, by which it will be found that it is necessary a body should fall through four times the height to double its ultimate speed, nine times the height to treble its ultimate speed, and so on, showing that the height, and, therefore, the power exerted in creating the motion, must be as the square of the ultimate speed, and, consequently, that the ultimate velocities of all falling bodies will be as the square roots of the heights from which they have respectively descended. In the case of two bodies of equal weight, therefore, moving in space, but of which one moves with twice the velocity of the other, the faster will have four times the amount of mechanical power stored up in it that is possessed by the slower, for it must have fallen from four times the height to acquire its doubled velocity; and the relative quantities of power capable of being exerted by bodies of the same weight, is measurable in all cases by the spaces through which the weight or pressure acts. A cannon ball, moving with a velocity of 2,000 feet a second, has four times the momentum of a cannon all of equal weight moving with a velocity of 1,000 feet a second."—Pp. 95, 96.

JOHN HARVEY, Capt. R.N.

Cheltenham, June 26.

CONCUSSION SHELLS AND NAVAL WARFARE.

SIR,—Having lately had occasion to refer to a file of newspapers of the year 1843, I happened to observe under the above heading, in the *Standard* of the 6th June, the following statements:—

"In the course of practice with Captain Norton's concussion shells at Woolwich, at the respective ranges of 1,250, 800, 600, and 400 yards, it was found that the shells exploded between the two bulkheads, placed 12 feet asunder, thus proving what formidable engines they are for naval warfare."

This is not only interesting, but important, inasmuch as it fixes conclusively the date at which the late General Chalmers, R.A. (at that time Captain, and Secretary to the "Select Committee"), announced that the result of the above trials was "so thoroughly satisfactory in every way," that the Committee had resolved to recommend the inventor, Captain Norton, to Government, for the ordnance pension of £500 a year.

I happen to know that the recommendation was duly forwarded, and yet from that time to the present —a period of *nineteen years*!—not one farthing has this gallant veteran received, either for this or for any other of his many most ingenious and valuable inventions, to the perfection of which he has devoted his fortune and his life. Yours, &c.,

HANS BUSK, Captain V. Rifles.

United University Club, July, 1862.

THE STRAIGHT LINE *VERSUS* THE WAVE LINE FOR VESSELS.

SIR,—I am quite willing to wait for the development of Mr. Cheverton's scheme for shipbuilding, and I do hope he will favour your readers with diagrams, so that something definite may be shown, and that his ship may merge out of the region of "day dreams," and at least take its place among "paper inventions."

Every man who has studied mechanics knows that it is not advisable to put matter at rest into *sudden motion*. It is quite possible to connect a steam-engine piston with its work in such a manner as to give the piston *uniform motion* from end to end of the cylinder, but no engineer in his senses would propose such a thing, for the simple reason that his machinery would be *jerked* to pieces. This uniformity of motion, so much desired by Mr. Cheverton, necessitates the *sudden* and momentary overcoming of the *vis inertiæ*; and, even if any advantages did accrue to this uniformity of motion, during motion, the inseparable *jerks* from a state of rest and to a state of rest, would form an insuperable objection to its adoption.

Now I say positively, that water is not an exception in this respect. Uniformity of motion is very well in itself, and *if* Mr. C. can attain it in the case of water without the drawbacks I have above mentioned, then I can only say he knows a form of vessel which was never before conceived, and the sooner he brings it out the better. What is commonly known as the straight line bow has hitherto in practice given very unfavourable results in comparison with the wave line form. In some important experiments with vessels 70 feet long, the straight line bow was very inferior to the wave line, but superior to the convex parabolic form.

If Mr. Cheverton will give definite answers to definite questions it will greatly simplify discussion, and I must request him in his next to say *what angle* of bow he prefers. I am, Sir,

Your obedient servant,

T. MOY.

1 Clifford's Inn, June 9, 1862.

ON THE USES OF CARBOLIC ACID FOR ENGINEERS.

SIR,—Most persons have by this time heard that there is such a substance as carbolic acid; comparatively few have seen it, fewer still have used it, and no one (so far as I can find) has yet noticed a very remarkable property which it possesses in relation to practical mechanics. For the information of those to whom the substance itself is unknown, a word or two will be sufficient to introduce it to their notice. Carbolic acid is one of the products of the destructive distillation of coal, and till within a few years vast quantities of it were utterly wasted. When perfectly pure it is a white crystalline solid, which by absorbing water soon changes into a colourless refractive liquid, having a faint odour of roses and tar. It is not an acid in the popular sense, not being either sour or corrosive, and should therefore, perhaps, be generally designated by its other title of phenole. Crude carbolic acid may be obtained in bulk for about a shilling a gallon, and is a dark tarry liquid, containing, perhaps, from ten to twenty different substances, in a state of mechanical admixture. Fortunately, this crude acid is available for the purposes to which I invite the attention of your readers. Just as oil is an *anti-frictional* liquid, so is phenole *pro-frictional*; or, to state it more correctly, as oil appears to keep surfaces in motion asunder by interposing a thin film between them, so phenole appears to make them *bite* and bind, by bringing them into absolute contact (after a manner of speaking), and removing even the finest film from between them. Any one may convince himself of this by placing a little upon a perfectly clean and dry oil-stone, and then rubbing up the face of a broad chisel upon it. The sensation of the bite (I know of no other word to express it) is very curious, and renders any further explanation unnecessary; it seems as if the stone and the steel had absolutely nothing between them, or even as if they were positively brought together by some attractive force. I have applied this property of carbolic acid to the following operations—grinding, filing, boring, and sawing in metal, with great apparent advantage. When dissolved in fifteen parts by measure of methylated alcohol, it forms a milk-white emulsion if poured into water, and it may be worth while to ascertain whether such carbolated water would facilitate the ordinary work of the grindstone, a point on which I am not able to speak with certainty. If any of your readers should experience, as I did, much difficulty in obtaining the crude carbolic acid, I shall have much pleasure in indicating the source from whence mine was derived, or in supplying any practical engineer with a small sample so long as my little quantity holds out.

I am, sir, your obedient servant,

JOHN EYRE ASHBY, LL.D.

Enfield, Middlesex, July 7th.

THE LATE GREAT FIRE IN LONDON.

SIR,—I wish to explain the reason why this fire raged with such intensity, as a similar fire might happen again. Saltpetre will not burn, belonging to that class termed incombustible salts. It contains, it is true, a very large quantity of oxygen, which it readily imparts to heated combustibles, with which it is in contact. Thus, if we throw a portion on burning coal (a hint that should not be lost on captains of oceanic steamers) the combustion will be brilliant and rapid, and the heat most intense, because the saltpetre supplies the coals with oxygen more abundantly than they could obtain from the air. The product of the combustion, however, will not be altered, carbonic acid gas or fixed air being disengaged in either case. The same remark applies to the salts of manganese.

Let me give a useful *warning* to insurance companies and others, to take every precaution with such a dangerous article as lampblack. There is no article so subject to spontaneous combustion, and it is usually stored in shops with other dangerous combustibles.

I am, Sir, your obedient Servant,

JAMES BRUCE.

June, 1862.

IRON ARMOUR-PLATED SHIPS AND LARGE GUNS.

SIR,—I have read with great interest the accounts in the papers respecting iron armour-plated ships and large guns.

During the discussion on national defences at the Institution of Civil Engineers some time ago, I said that it was idle to talk of invulnerable ships till we knew the power of artillery; that up to that time we had never seen a really large gun. The results lately obtained have justified my words, and I again repeat them as applicable to the present moment.

I will undertake to make a gun which will throw a fifteen-inch rifled bolt with a velocity of 1,600 feet per second. Such a gun, in a Cole's shield, and a proper gun-boat, would demolish either land batteries or iron-plated ships. Speed is not required—such gun-boats would not need to run away. They would steam slowly and steadily up to any fort, or place themselves along side of any attacking vessel if used as defences. One shot would do the work.

Such guns and such vessels will be made, and the sooner our Government tries them, the sooner will the country escape the present monstrous expenditure, and be in a true condition of defence.

I am, Sir, your obedient servant,

JAS. A. LONGRIDGE.

PUNCHING PLATES.

SIR,—"A Civilian" observes in your impression of the 27th ult. that I no doubt "succeeded in punching *a* 1¼ inch hole in a 1¼ inch plate, but this must have strained the machine, and was a *tour de force*." I beg to say that it was nothing, of the sort; for instead of *one*, or, as he has it,

"a 1¼ inch hole in a 1¼ inch plate" being punched by that press, it punched some *thousand or so* of that diameter through plates of that thickness, *without the slightest damage* either to punch or press, nor was the bolster used widely coned either. The punches had the ordinary flat face, and centre punches also were used according to fancy.

I do not in any way "admit" that I "broke a machine" in punching the 1¼ inch hole in the 1¼ inch plate; what occurred was the *straining*, not the "breaking" of the press, which I should have said was not so strong or heavy as the other; and I may add that this self same press is now at work on ordinary work, precisely in the same condition as it was when we ceased experimenting with it.

Yours obediently, C. F. T. Y.

London, July 5th, 1862.

Gossip.

Mr. R. Barclay, of the Montrose Museum, has invented a method of facilitating the inspection of coins, medals, &c., in collections and museums. It consists of a little frame in which the coins are fixed so that by turning it round the obverse and reverse of the coin can in turn be examined, even although protected by glass cases. The invention is very simple, and at the same time might be of great advantage if applied to some of our collections in museums, &c. Mr. Barclay has not patented it, but trusts that those who employ it will send any duplicates, &c., to the Montrose Musuem.

Captain Mansfield, in distributing the prizes among the pupils in the Mercantile Marine Association's School, Ingate, Conway, last week, related the following anecdote :—" To illustrate the importance of knowledge. His grandfather many years ago commanded a line-of-battle ship, and once engaged a French line-of-battle ship of similar size and captured her. (Hear, hear.) He put a prize crew on board, but his own vessel was so riddled that soon after the fight she sunk, and all were lost except himself and fourteen men, who escaped in one of the boats. They had no compass or instrument to steer by except a watch, which told them the position of the sun by day and the stars by night. With the help of that watch alone he steered over 800 miles of ocean and found a port.

M. Lamiral, who has been sent on a scientific mission for the purpose of collecting sponges, in order afterwards to transport them to the coast of Algeria, where endeavours are to be made to acclimatise them, will commence his operations on the coast of Syria. The sponges will have to be taken up together with the fragments of rock to which they are attached; to effect this M. Lamiral is provided with a submarine boat of his own invention. This apparatus is also to be applied to the fishing of the pearl oyster in the Indian waters, and its subsequent introduction into the Mediterranean, as our readers know. Another bivalve will also form the subject of M. Lamiral's experiments—viz., the byssus, which is covered with a thick beard, about eight inches in length. This beard is composed of silky airs, which were woven by the ancient Egyptians into precious stuffs, and then exported to Tyre, where they received the purple dye for which that place was so celebrated. Even now the Sicilians and Calabrese manufacture silky tissues with this substance, which is of a yellowish-brown colour, with a greenish shade.

IMPROVED STEAM FIRE ENGINE.—On Monday an improved land fire engine, by Shand and Mason, was publicly tested in London. The machine can be drawn with as much ease as one of the common hand engines, by two horses. The water was discharged in a steady column above 150 feet perpendicularly. The trial was very successful.

EXPORTS OF MACHINERY.—Ten years ago the value of machinery of all sorts, including steam engines, exported from the United Kingdom, amounted to £1,167,611 only. Last year it reached almost 4½ millions sterling—an increase in the ten years of more than 300 per cent. The countries to which this vast quantity of machinery was sent in 1861 cannot be given, as the accounts for the year are not yet completed, but the particulars for 1860 are subjoined: Russia, £696.264; Sweden, £56,977; Hamburg, £157,204; Holland, £110,956; Belgium, £113,137; France, £171,020; Spain, £308,491; British East Indies, £642,939; Australia, £228,320; Mauritius, £93.239; British West Indies, £111.749; Egypt, £107,527; Turkey, £61,640; Kingdom of Italy, £114,904; Cuba, £84,057; Brazil, £94,315 Prussia, £73,116; Norway, £51,350; United States, £40,218 Hanover, £94,326; all other countries, £426,162; making a total for 1860 of £3,837,821.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgment :—

STEAM ENGINES, &c., 3120, 3123, 3126, 3175.
BOILERS AND THEIR FURNACES, &c., *None*.
ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 3133, 3149, 3157.
SHIPS AND BOATS, including their fittings, 3129, 3130, 3132, 3182, 3187, 3194.
CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, *None*.
FOOD AND BEVERAGES, including apparatus for preparing food for men and animals, 3118, 3127, 3139.
FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 3122, 3131, 3136, 3151, 3153, 3155, 3162, 3165, 3174, 3181, 3183, 3192, 3193.
BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c. *None*.
LIGHTING, HEATING, AND VENTILATING, 3124.
FURNITURE AND APPAREL, including household utensils time-keepers, jewellery, musical instruments, &c., 3121, 3134, 3145, 3158, 3159, 3160, 3161, 3172, 3176, 3189.
METALS, including apparatus for their manufacture, 3142, 3150, 3186.
CHEMISTRY AND PHOTOGRAPHY, 3147.
ELECTRICAL APPARATUS, 3170.
WARFARE, 3119, 3154, 3166.
LETTER-PRESS PRINTING, &c., *None*.
MISCELLANEOUS, 3125, 3128, 3135, 3137, 3138, 3140, 3141, 3143, 3144, 3146, 3148, 3152, 3163, 3164, 3167, 3168, 3169, 3171, 3175, 3177, 3180, 3184, 3185, 3191.

3186. W. MAKIN. *Improvements in the manufacture of cast-steel, mill chisels, and other taper tools and files* Dated Dec. 20, 1861.

Here the inventor cuts or casts in the face of the forge hammer anvil a recess or die that exactly corresponds with the form of one side of a mill chisel, file, or other taper tool, and he also cuts or casts in the face of the forge hammer a similar recess or die that exactly corresponds with the form of the other side of the mill chisel, file, &c., so that when the hammer is in contact with the anvil, the two recesses or dies together form a mould or groove corresponding with the jointed or tapering end of the mill chisel, file, &c. By this arrangement the steel of which the tool is to be formed on being forged or caused to enter into and fill out the mould or die in the hammer and mill is thus formed into the exact shape required. *Patent abandoned.*

3187. J. and J. STANFIELD. *Improvements in machinery or apparatus for giving motion to ships and machinery, and for raising water.* Dated Dec. 20, 1861.

This consists mainly in the use of an open cylindrical case in which a number of vanes are arranged radially, but which are set in an oblique direction, so that any fluid impinging upon or projected against such vanes shall give a rotary motion thereto, and, consequently, to the case containing them. *Patent abandoned.*

3188. J. SMITH and J. B. HIGGS. *Improvements in thrashing machines, and in mills for grinding, and in raising or moving grain in granaries and other places.* Dated Dec. 20, 1861.

This invention is not described apart from the drawings. *Patent completed.*

3189. C. E. WILSON. *Improvements in collars for gentlemen's, ladies', and children's wear.* Dated Dec. 20, 1861.

This consists in sewing to the collar, at a short distance from its outer edge, a border or hem turned up to the under or wrong side of the collar, and stitched or sewn thereto, and in sewing to the collar on the right side, and near the border or hem, one or other number of tucks, extending parallel with the border from the two extremities of the band. The collars may be cut of any desired shape, either angular or curved at the corners. *Patent abandoned.*

3191. J. WESTWOOD. *An improvement in the construction of hydraulic presses.* Dated Dec. 20, 1861.

The object here is the construction of hydraulic pipes so that the cylinder and ram are capable of being moved to one side or the other of the press by traversing gear fitted to such cylinder. For this purpose the cylinder containing the ram is fitted with a traversing motion, consisting of a wrought iron ring, into which the bottom end of the cylinder is fixed. The ring has straight sides which work in V guides, and on the upper side of the ring are formed two bosses, one on each side of the cylinder, such bosses having internal screws, through which are passed two wrought iron screws mounted in suitable bearings on each side of the lower cross head of the press. These screws have each a spur wheel at one end gearing into a pinion mounted in the centre of the width of the lower cross head, and worked by a winch handle. By this means the cylinder and ram are capable of being moved from one side of the press to the other on the lower cross head, as may be required, but the traversing gear may be varied. *Patent completed.*

3192. G. MAY. *An improved method of utilising bags, wrappers, or other similar articles made of paper or other material, and in any form.* Dated Dec. 20, 1861.

Provisional protection has not been granted for this invention.

3193. G. WALKLAND. *An improved machine for winding lace or other similar fabrics or tissues on cards or other materials.* Dated Dec. 20, 1861.

We cannot here give space to the details of this invention. *Patent completed.*

3194. W. TIPPLE. *Improvements in paddle-wheels for the propulsion of ships and other navigable vessels.* Dated Dec. 20, 1861.

Here the paddles are hung in bearings upon cross-shafts with the dipping paddles or float-boards inclined inwards towards the circle of the travel of the wheel. This inclination is self-existing or adapting, so that the wheel turns upon its axle, and the paddles hang stationary except those that are in action in the water. The angle of inclination is given to the paddle by the leverage that exists in the bearings that are used to hang the paddles. The balancing of the paddle is effected by placing the cross-shaft thereof a little below the centre or middle of the paddle, so that when the paddle is making the sweep under the paddle-shaft the resistance shall be equal, the lesser surface sweeping through the dense or deep water, while the greater surface above the cross-shaft sweeps through the lighter or the shallow water, by which equality of pressure on the surface of the paddle is effected. This being the case it is only necessary to give the paddle stability in its position, which is accomplished by placing compactly shaped weights upon the bottom of the paddles; these weights have a pendulous power, being hung upon the end of a moving leverage. *Patent completed.*

3195. V. D'ALMEIDA. *An improved mode of obtaining colouring matter applicable for dyeing skins, silk, wool, or other fibrous materials.* (A communication.) Dated Dec. 20, 1861.

This consists in extracting colouring matter from a mollusc known by naturalists as the aphysia. The inventor takes several of these animals, and by exerting pressure thereon extracts a liquid colouring matter therefrom, which he places in a vessel, and imparts heat thereto of about 50 degrees of Fahrenheit. To the colouring matter he adds water, varying in quantity according to the tint or depth of colour required, and varying from lead colour to purple. By these mens he obtains colour suitable for dyeing skins, silk, &c , without requiring to use mordants. He also obtains a rich colour resembling that obtained by the use of conchineal, indigo, and carmine. *Patent abandoned.*

3196. W. CLARK. *Improvements in apparatus for the manufacture of matches.* (A communication.) Dated Dec. 20, 1861.

This consists, 1, in obtaining the splints separate one from the other, instead of in the form of a comb, which the inventor effects by the application of a comb or divider placed near the cutting cylinders which separates and conducts the said splints under a reciprocating knife, which cuts them the desired length. 2. In placing the matches or splints in rows in a frame or press, in order to apply the sulphur and phosphorous with rapidity. This frame is placed vertically behind the reciprocating knife, and has a descending motion imparted to it, by which it packs the splints for forming the matches in superposed rows or layers. 3. In the apparatus for transmitting movement to the various parts of the machine. The invention is not described apart from the drawings. *Patent completed.*

3198. R. A. BROOMAN. *A new or improved method of preparing silk fabrics to be employed in the manufacture of hats, caps, and bonnets.* (A communication.) Dated Dec. 20. 1861.

The object of this invention is the preparation of silk fabrics to fit them for the bodies of hats, caps, and bonnets, without the employment of any other stuff. The invention consists in applying to the back of the silk fabric various dressings which render it waterproof, and impart to it the necessary stiffness for the bodies of hats, caps, and bonnets. The preparation of the silk is effected by successive dressings, and those which are preferred are as follows :—The inventor begins by spreading over the back of the silk a layer or coating of gelatine, and allows it to dry. He then applies a coating of caoutchouc, and over this the dressing usually applied in the trade. The silk will thus have acquired the necessary stiffness and impermeability without the face being touched, and which consequently preserves all its lustre and brilliancy. *Patent abandoned.*

3199. E. E. PEREAU. *An improved composition for cleaning and revivifying woollen cloths and other fabrics and the colours thereof.* (A communication.) Dated Dec. 20, 1861.

This composition is made either white or coloured, and in either case the patentee gives it the trade name of "Eau ecarlate." It cleans and removes the stain from, and revivifies the colour of, woollen and other fabrics, as well as the fabrics themselves. It is formed of citric acid, carbonate of potash, alum, alcohol and water, to which colouring matter, say, for instance, cochineal, may be added to impart the colour required. *Patent completed.*

3200. R. WAILES. *An improved tool or apparatus for cleaning windows and glass.* Dated Dec. 20, 1861.

This apparatus is intended chiefly for cleaning the outside of windows from the inside, but it is also applicable for cleaning windows and glasses generally. The improved tool or apparatus consists of a plate of any convenient size, say eight inches by five, clothed on the face with felt, woollen or other cloth, and padded or not with wool or other soft material between the face of the plate and the cloth; the cloth is again covered with silk. To the back of the plate a holder is hinged. To admit of the holder being held at any required angle with respect to the plate, the patentee also adds a rack or other means whereby the said angle may be adjusted, and the respective positions fixed according to requirement. The lower end of the holder is inserted in a handle. *Patent completed.*

3201. T. and W. GREEN, and R. MATTHEWS. *Improvements in lawn-mowing rolling collecting machines.* Dated Dec. 20, 1861.

Here, in constructing lawn mowers, the patentees make the outer edges of the main drum or drums rounded, so as to prevent them cutting or marking the turf. When two

drums are employed, they place the catches for throwing the cutters into or out of work between the two drums, and arrange them so that they are both acted upon by one lever instead of two as hitherto outside of each drum. To adjust the cutters (usually spiral blades ranged round an axis) they employ carriages or plummer blocks having a set screw acting on the top, and a spiral or other spring on the under side of them, the carriages or plummer blocks carrying the axis of the cutters; this arrangement allows of the adjustment to the greatest nicety. To give motion from the drum shaft to the spiral cutters, they employ an internal toothed wheel on the drum shaft, by which they can employ a wheel of greater diameter than when using an externally toothed wheel. The grass boxes of mowing machines they make of thin sheet iron, having suitable devices stamped upon them ensuring strength and lightness. The front or leading roller is made of thin iron discs having bosses on each to keep them any suitable distance apart, the discs being mounted on an axis, and each disc being free to revolve. *Patent completed.*

3202. G. T. BOUSFIELD. *Improvements in machinery for attaching the soles of boots and shoes to the upper leathers.* (A communication.) Dated Dec. 20, 1861.

This consists in a machine which, when placed upon the edge of the sole after it is temporarily secured to the last upon which the upper leather is stretched, will, on being struck by the blow of the hammer of the operator, make a hole for the reception of a peg, drive a peg through the sole and upper leather, move itself along so as to be in position for a repetition of the operation, and feed up the peg wood so as to bring another peg into the proper position to be split off and driven. The invention is not described in detail apart from the drawings. *Patent completed.*

3203. D. C. LE SOUEF. *An improvement of cylinders used in printing calicoes and other textile fabrics.* (A communication.) Dated Dec. 20, 1861.

This consists in coating or covering cast-iron cylinders with copper, by any of the processes of electro-plating iron with copper. The copper surface thus produced on the iron cylinder or roller is then engraved with the desired pattern or design, and used in place of the solid copper rollers. *Patent completed.*

3204. J. WAKEFIELD. *Improvements in sewing machines.* Dated Dec. 20, 1861.

The object here is an improved mode of regulating the movements in relation to the shuttle, so as to obtain an increased facility in adjusting movements to the action of the shuttle. For this purpose, the crank-pin on the driving shaft is made to work in a slot in an oscillating-rod connected by a link, with the ordinary rocking shaft, which acts on the needle bar. The slot in the said rod is so formed as to impart to the needle-bar, through the above connections, a slow motion, when the needle is passing through the material to be sewn, next to raise the needle bar so as to make a loop in the thread, then to allow the needle-bar to rest while the shuttle is passing through the loop as required to form the stitch, and then raising the needle to take up the stitch. The rod has also a straight slot at the lower part, so as to admit of its moving up and down as required, through which slot is passed an adjustable pivot for the rod to oscillate thereon. This pivot carrying a roller is adjustable by a screw passed through a slot in the frame of the machine, so as to give greater facility for accurately turning the movements of the needle in relation to the shuttle. *Patent abandoned.*

3205. T. MORRIS, R. WEARE, and E. H. C. MONCKTON. *Improvements in submarine and other telegraph communication, and in apparatus connected therewith.* Dated Dec. 21, 1861.

Here the electric current employed is obtained by the medium of an induction coil of the following construction. Upon an iron core, or a bundle of iron wires, two or more layers of thick insulated copper ribbon are to be coiled; one end of this wire or ribbon is attached to one side of a voltaic battery, and the other to one side of an automaton break of a novel construction, and the other side of this break is attached to the other side of the battery. This automaton break is self-cleaning, whereby a more uniform action is obtained. Instead of causing a spring to come in contact with a pin, the patentees make the break spring in two parts, or divide it so that the break pin passes between the slit of the spring, or between the two springs, by which means the friction keeps the surface clean, thereby making better contact between the battery and primary wire or ribbon. To this break is attached what is termed a condenser, which is constructed as follows:—Sheets of gutta-percha, india-rubber, &c., are cut to the desired size, and upon each sheet is laid a sheet of metallic foil, cut a little smaller than the sheets of insulating material, and placed alternately to extend over the insulator at one end, for the purpose of being connected in such a way that, if the condensers consisted of thirty plates or sheets, twenty-five of them would be connected at each end, these ends being joined to the break Upon the thick wire or ribbon, and carefully insulated therefrom, they coil a finer insulated copper wire, and between each layer they insert a sheet of gutta-percha, india-rubber, or varnished paper, and as they increase the number of layers, they increase the thickness of the insulating material. The first end of this thin wire may be connected with a line wire of a telegraph, or to the earth connection, the last end of the coil to one side of an instrument, which they term an interrupter, and the other side of the interrupter is to be joined to the telegraph. The interrupter they construct in the following way:—Upon an insulated stand they erect two metal pillars, having connecting-screws to attach the wire from the coil, and the wire from the telegraph. Upon these pillars they arrange an adjusting screw or screws, by which the conducting wire is divided, and may be adjusted to any amount of separation according to the length of the communicating wire. *Patent completed.*

3206. W. BENNETTS. *Improvements in the mechanism required for and in the manufacture and composition of gunpowder.* Dated Dec. 21, 1861.

The ingredients employed are lime, nitre, sulphur, and charcoal; the lime is dissolved in sufficient water to bring the other ingredients into a paste. The lime, after having been made into a solution, is strained through a fine sieve. This solution is then added to the other ingredients, and the whole is ground until it becomes a paste; it is next passed between two rollers, one of which is grooved, and the other plain. The paste, by passing through the rollers, is formed into long strips of a triangular shape. It is next carried on an endless web or canvas over some hot tubes, and it is now in a state in which it can be easily broken into grains. *Patent completed.*

3207. F. GRIMALDI. *Improvements in rotary steam-boilers.* Dated Dec. 21, 1861.

This relates to the invention for "the instantaneous generation of steam," for which a patent was granted to the present patentee, 9th August, 1860 (No. 1,927). The most important part consists in fitting the rotatory boiler either with small tubes or internal flues, so as to greatly increase the heating surface. In case of the boiler being fitted with tubes, the latter almost fill the boiler, leaving only some space for the steam and feeding pipes. When the boiler is a flue one, the internal flues are generally four in number, and are placed round the axis of the boiler. The invention also consists of taking the steam as near as possible to the top of the boiler, so as to prevent any priming. Therefore, the steam-pipe on entering the boiler through one of the tubular trunnions, is bent up to the top of the boiler, as far as it can go. This arrangement, however, is not applicable to those boilers which are fitted with straight tubes or straight flues. *Patent completed.*

3208. W. M. WILLIAMS. *An improvement or improvements in treating coal and other bituminous minerals, and peat, in order to obtain solid and liquid hydrocarbon therefrom, and in apparatus to be used for that purpose.* Dated Dec. 21, 1861.

The patentee claims, 1, treating coal and other bituminous minerals and peat, so as to obtain solid and liquid hydrocarbons therefrom, that is to say, subjecting these substances to a distillatory process, so conducted that the volatile products produced pass rapidly downwards from the heated part of the apparatus, so as not again to be exposed to a temperature equal to that at which they were produced. 2. Constructing and arranging the retorts or distillatory vessels so that heat is applied at the top of the said vessels, and the volatile products conducted by a descending motion from the heated parts of the said apparatus. The invention cannot be fully described apart from the drawings. *Patent completed.*

3209. A. L. ALLCHIN, and W. ALLCHIN. *Improvements in apparatus applicable to the superheating of steam.* Dated Dec. 21, 1861.

Here, for locomotive or portable boilers, the patentees construct a series of tubes in a syphon, or approximatively syphon form, placed within the smoke box and above the flue tubes of steam-boilers. This apparatus is to be connected to the steam space of the boiler, and also to a pipe through which the superheated steam is conveyed to the cylinders of the steam engine. They also construct a double channel or box of a D form, with an outer and an inner coating, leaving sufficient space for the steam between, and thus secure the action of the heated gases in the smoke box of a boiler, and this box or chamber is connected to the steam space of the boiler and to the cylinders of the engine. In constructing stationary boilers they connect a series of tubes of convenient length in a syphon, or approximatively syphon form, placed within the flues or tubes of a boiler. They also connect one or more ends of these tubes to the steam space of boiler, and to a pipe or pipes conveying the superheated steam to the cylinders of the engine. They also construct a tube or tubes one within the other. The heated gases pass through the inner tube, and around the external portion of the outer tube or tubes, the space between being occupied by the steam to be superheated. They connect these tubes or pipes together at each alternate end or otherwise; or they may be all connected together at one end to a pipe or pipes from the steam space of a boiler, the other end or ends being connected to the steam pipe or pipes, so as to convey the superheated steam to the cylinders of the engine. For marine engines, it will only be necessary to modify the details of the above arrangements according to the form of the boiler. *Patent completed.*

3210. W. C. MILES. *Improvements in lamp-glasses.* Dated Dec. 21, 1861.

Here the inventor uses a glass globe and also a glass chimney, but instead of the chimney descending within the globe, it terminates at the top of the globe, on which it may be fitted to remove as desired. *Patent abandoned.*

3211. F. SELBY. *Improvements in boilers for the generation of steam in engines for applying motive-power purposes, and in wheels and ways for steam carriages to run on.* Dated Dec. 21, 1861.

The first part of these improvements relates to the construction of the boiler or generator, by which steam is very rapidly made. The patentee calls the boiler "a multitubular coil" boiler. The coils are of small diameter and fixed vertically, and take the place of ordinary straight boiler tubes when vertically fixed. The shell of the boiler may be of any convenient form, and may be double cased to form water spaces. The water passes through the coil tubes and the fire acts outside around them. Further, for a circular or other vertical boiler, the steam is collected in a dome, a separate part from the boiler, through which the gases from the furnace pass, by means of a number of vertical tubes placed in the dome, into the stack, whereby the steam becomes superheated. The second part of the invention relates to the cylinders when used of different diameters with expansion and with or without condensation. He places the small cylinder into which the steam first enters within a larger cylinder, which larger cylinder is therefore an annular cylinder, and these two are placed (if desired) in a still larger cylinder, which would also be an annular cylinder. The valves can be arranged as desired, either with a single valve rod and single eccentric, or with separate rods and eccentrics; also the cranks may be opposite or in the same line, and one crank may be used as found most convenient, or the cranks may be at right angles. The third part of the invention relates to the transmission of motion from the crank axle to the driving axle, where gearing is used, specially applicable to paddle-wheel steamers, traction and locomotive engines. The driving axle being much subject to vibration is made into two shafts, that is, is divided in the centre; the inner ends are hung on swivel or ball bearings, whereby the shaft is allowed to move in one direction both up and down; the geared wheels hang over the centre of these bearings, and being geared into a pinion or wheel on the crank axle can never get out of gear, or cross the teeth, one fitting into the other, the face of the wheels being convex and concave according to the radius taken from the swivel bearings and the diameter of the wheels. The other ends of these half shafts are fixed as is usual, and kept in their places by springs. The fourth part of the invention relates to the wheels of locomotive and traction engines, and the tram-way for them to run on. The rim of the wheel is made of an inverted V shape, with or without flat side rims, so as to run on a tramway or not; the rails are in the form of tubes of wrought or cast iron, or of a half circle, by which means the engine will gain more tractive power than with ordinary flat rails. Where no tramways are used, he fixes a flange on both or either side of the wheel, which may be called a flange wheel, of smaller diameter than the other part of the rim, so that when the engine runs over soft ground, it will bear on the flanges as well as on the wheels; and lastly, he fixes on the rim of the wheel, at convenient distances apart, plates, by preference, in the form of horse shoes, to give greater power to the forward motion of the engine, and thereby prevent slipping. *Patent completed.*

3212. W. KEMPE. *Improvements in scrays or tables applicable to gig mills, brushing mills, and other like machinery.* Dated Dec. 21, 1861.

The patentee claims the construction of mechanism as described, whereby the folds of cloth received on to a moveable scray are caused, by the form and motion of the scray, to be turned over before passing off the scray, and so that that which was undermost when received on to the scray is uppermost when about to pass off the scray. *Patent completed.*

3213. C. OSMAN. *Improvements in the manufacture and application of elastic or yielding surfaces for sitting, lying, or reclining upon.* Dated Dec. 21, 1861.

This consists, 1, in manufacturing elastic surfaces of vulcanized india-rubber of cellular form, and in applying the same to the construction of cushions, mattresses, chair and couch seats, &c. 2. In forming elastic or yielding surfaces for sitting, lying, or reclining upon, by connecting the upper or lower ends, or both, of a series of lever arms by strips or bands of vulcanized india-rubber. 3. In forming elastic or yielding surfaces by a series of curved springs, arranged and supported on a fixed stationary surface or surfaces, such springs being caused to support a cushion, mattress, or other surface for sitting, lying, &c., so as to yield on pressure being applied to any part. 4. In forming elastic surfaces for sitting, lying, &c., by causing the cushion, mattress, or seat to be supported upon projections carried by a series of helical or other springs. *Patent abandoned.*

3214. J. H. JOHNSON. *Improvements in apparatus for cleaning wheat and other grain.* (A communication.) Dated Dec. 24, 1861.

This apparatus consists of a vertical shaft, provided with a number of dished or inverted truncated cones, having their peripheries higher than their centres. Between each pair of these plates is a stationary, conical, or dished-shaped plate, similar to those carried by the vertical shaft, but secured to an outer casing which surrounds this portion of the apparatus. Inside the outer casing, which is provided with openings at intervals, is fitted a perforated or roughened metal plate or cylinder, against which the grain which falls on to the upper one of the set of revolving plates is directed or thrown by the centrifugal force generated by their rotation, and then falls on to the stationary plate beneath, which directs it to the centre of the next lower revolving plate, when it is again thrown against the perforated roughened plate, and falls on to the next stationary conical plate, and so on, finally entering a coffer, and passing down a shoot to a riddle or sieve, being surrounded by a fan blast as it is leaving the mouth of the shoot. The degree of inclination of the rotatory and fixed plates will depend upon the speed at which the apparatus is to be worked. *Patent completed.*

3215. L. R. BODMER. *Improvements in looms for the manufacture of sacks, knapsacks, mattress cases, and other goods.* (A communication.) Dated Dec. 24, 1861.

This invention is not described apart from the drawings. *Patent completed.*

3216. MRS. C. SMITH. *Improvements in stays.* Dated Dec. 24, 1861.

This invention relates to stays for adults and children, and consists in applying to the back of stays means for adjusting the stays to the body of the wearer after they have been fastened in front, that is to say, means of tightening the stays, or allowing them to expand so as to cause them to fit more perfectly or comfortable. Near the centre of the back of the stay the patentee makes a vertical opening strengthened at each edge by bones or other stiffenings, which she prefers should extend from the top to the bottom of the stay, and from the bottom of the stay to, say about four inches upwards, more or less, she inserts a gore, which may be of the same material as that of which the stay is made, between the two bones or stiffenings. The upper portion of the parts so strengthened by bones or otherwise she connects together by means of a piece of material which may be of the same description as the rest of the stay, so that there shall be a slot or opening of a length equal to about one-third the height of the stay. To each edge of the opening she fixes a strap of any suitable material, which is made sufficiently long to extend to the front of the stays, or nearly so. She attaches the straps to the stays in such a way that one of the straps shall pass under the other, and the end of each strap is

made capable of being secured in front to fastenings fixed to the stays, in such a manner that they may be drawn more or less tight at pleasure, and there fixed, so as to cause the sides of the opening at the back to be drawn and held more or less nearly together. *Patent completed.*

3217. J. ROBINDELL. *An improved method of, and apparatus for, separating solid from liquid substances.* Dated Dec. 24, 1861.

This invention consists in effecting the separation by means of metal strainers or bags of some pervious material, placed in metal or other frames under and in communication with a pipe or pipes, in which a pressure of the liquid from which the solid is to be separated is maintained by a head or column of the said liquid. The liquid itself is held in a supply tank at the top of the column, and cocks are fitted at top and bottom of the pipes to admit and shut off the supply as required. *Patent completed.*

3218. MRS. C. SMITH. *Improvements in stays.* Dated Dec. 24, 1861.

This invention relates to stays for adults and children, and consists in the employment of fastenings permanently attached to each side of the opening in the front of stays, so as to avoid fixing any fastenings upon the steel or other busks of the stays, which are made plain, and removeable as hereinafter described. One part of each of the fastenings is fixed to one side of the opening of the stay, and the other part of the fastening to the opposite side of the opening, so that when the stay is put upon the body with the opening in front of the wearer, the corresponding parts of the fastenings may be put together so as to secure the sides of the opening. The busks which the patentee prefers to use consist of a plain strip of steel rounded at top and bottom. For every pair of stays two such busks are used, one being inserted in a sheath made for its reception at each side of the opening. When the stay is on the wearer, and fastened, the two busks are brought near together, and give the necessary and usual support in front. *Patent completed.*

3219. E. EDE. *Improvements in the construction of horse-shoes.* Dated Dec. 24, 1861.

The iron used for the purpose of this invention consists of a flat bar, having a ridge along the centre of the upper side thereof, such ridge being of any desired height. The flat portion of the iron is placed next the horse's foot. *Patent abandoned.*

3220. J. F. HARVEY. *Improvements in umbrellas and parasols.* Dated Dec. 24, 1861.

Here the patentee forms the top notch upon a tube extending downwards to carry the top catch, so as to avoid the necessity for applying the top catch in the stick, as is the general practice, and by which the stick is weakened at that part. He also forms this tube, by preference, of an internal diameter, larger than that of the same part of the stick, by which the improvements are well adapted to those sticks which are of a taper form. The tube of the top notch may be packed to the stick, and it may be held to it by riveting, and by the gathering in of the lower edges or other part. The runner is formed with its tube extending upwards, and so as to pass closely on to the tube of the top notch, with a slot or slots to receive the top catch. This tube of the runner also carries a ring or slide to act upon and release the top catch when the umbrella or parasol is desired to be closed. He also applies a cap acted on by a spring, by which it has a tendency to slide over, and by enclosing the ends of the stretchers, to hold the parts close, and retain the parasol or umbrella closed. *Patent completed.*

3221. A. V. NEWTON. *Improved means for reducing the friction and wear of slide valves for steam-engines.* (A communication.) Dated Dec. 24, 1861.

This consists in combining the slide-valve of a steam-engine with a well-known arrangement of mechanism termed the "parallel motion," from which it results that the valve is sustained by such mechanism, so as to prevent it from being pressed to its seat with a force due to the pressure of the steam, while at the same time it permits the valve to slide back and forth on the required plane, thus greatly reducing the friction and the wear of the surfaces of the valve and valve-seat. The invention also consists in combining with the slide-valve and the "parallel motion" a spring, or the equivalent therefor, which will yield to the pressure of the steam on the valve, and thereby ensure the contact of the face of the valve with its seat. The invention also consists in combining with the frame in which the "parallel motion" mechanism is mounted (and which is contained in the steam chest) a lifting mechanism, extending to the outside of the steam chest, by which the valve can be lifted entirely clear of its seat, to prevent the wear of the parts during the working of the engine after the steam has been shut off. *Patent completed.*

3222. T. E. VICKERS. *Improvements in the wheels of railway engines and carriages, and in the machinery or apparatus to be used in making the same.* Dated Dec. 24, 1861.

This consists in casting the wheels in steel, and of a disc form, of a peculiar character. The nave and rim, or tyre, of the wheel, together with the disc which connects these parts together in the place of spokes, are all cast in one piece, so that there will be no danger of the rim or tyre becoming loose, or coming off. Also in constructing these disc wheels with double corrugations, so combined as to cross each other This form of disc wheel is cast in a mould lined with fire-proof material, as described in the specification of a patent granted to E. Riepe, on the 9th July, 1853 (No. 1637). The mould may be made from a wooden pattern, or by means of an apparatus which forms the subject of a part of this invention. *Patent completed.*

3223. E. B. SIMPSON. *Improvements in apparatus for drying wool and other fibres and substances.* Dated Dec. 24, 1861.

For the purposes of this invention a rotating vessel or chamber, of a cylindrical form, is employed. The vessel has two ends or covers, through which the axis of an internal heating chamber or vessel pass. The ends or covers are formed with holes or openings to allow steam or vapour from the wool or other substance (such as feathers and seeds) within the vessel to pass away freely; it is preferred that holes or passages should be formed for the same purpose in the revolving chamber. It is desirable that after provision has been made for the free passage away of steam or vapour, the rotating vessel should be as close as may be, to retain the heat therein. In order to introduce and remove the substances into and from the revolving vessel, part of the periphery is made to open. Within the revolving vessel there are rows of projecting teeth, radiating towards the centre, or other provision is made in order that the wool or other substances may not slip towards the lowest part of the vessel as it revolves on its horizontal axis. The internal central vessel is likewise cylindrical, and heated with steam. The mode of applying heat may be varied. It is desirable that this internal vessel should revolve so as to ensure that the wool or other substance when it falls on to the heating vessel, shall slide therefrom on to the lower part of the rotating vessel or chamber. If desired, the rotating vessel may be made of such a form as to admit of its being heated, and thus by its heat also contribute to the drying of the substance. By these arrangements the wool or other fibre within the vessel will be continually raised up to the highest position, and then allowed to descend to the lowest position, through the heated atmosphere of the chamber, and in contact with the heated surface. *Patent completed.*

3224. J. B. WOOD. *Improvements in the manufacture of driving straps or bands, the backs of wire cards, and cop tubes.* Dated Dec. 24, 1861.

In the manufacture of driving straps or bands, the inventor takes buffalo hide, previously macerated in water, and converts the same into pulp by rollers or otherwise. The mass alone, or mixed with flax, &c., is passed through rollers, some of which are covered with felt, then passed over warm cylinders, and finally cut into the proper widths for straps or bands. In the manufacture of cop tubes the substance or pulp is rolled out into thin bands, the width of which is in accordance with the length of the tube required, and, when partially dry, is cut into lengths of the shape and form required, each length being subsequently wound upon a steel mandrel; it is then placed in a die adapted for the purpose, the pressure of which converts the folds of the tube into one uniform substance. *Patent completed.*

3225. F. LAURENT and J. CASTHELAZ. *Improvements in the manufacture of colouring matters.* Dated Dec. 24, 1861.

Here the patentees take nitro-benzine, or nitro-toluine, or other homologue of nitro-benzine, or a mixture of these substances, or a substance containing some or one of them, and by a process of deoxidation they obtain a red colour, varying somewhat in shade, ascending to the method in which the deoxidizing process is conducted, and the extent to which it is carried. The decarbonizing process preferred is to mix with the nitro-benzine or other material, iron-filings and hydro-chloric acid. The colouring matter when formed may be purified by dissolving it in water, and precipitating it by saline solutions. *Patent completed.*

3226. J. COCHRANE. *Improvements in apparatus employed in sinking cylinders and open coffers for forming foundations under water.* Dated Dec. 24, 1861.

Here, when sinking cylinders or open coffers of other sections, there is formed at the upper part a chamber with an opening into it from the outer atmosphere, and also an opening into the cylinder or coffer below. Both these openings are arranged, as heretofore, to be closed air tight, and are for the passage of the workmen into and out of the cylinder or coffer; the required length of cylinder or coffer of other section is also, as heretofore, made in suitable lengths, provided with internal flanges to fix them together. The buckets to carry up the earth or materials are caused to ascend and descend in a pipe or pipes, which descend from a point above the upper closed chamber down to, and so as to dip into, a recess or well, if desired, where the work is being carried on. The descending pipe is made in lengths, corresponding with the lengths of the cylinder or coffer of other section, and is of such diameter as to allow a bucket to pass up and down freely, leaving a space all round for the free passage of water. By these means when the water is driven out of the cylinder or coffer of other section by compressed air, it will remain in the pipe, and will stand at or about the same level as it does outside of the cylinder or coffer. The buckets are raised and lowered by any suitable mechanism outside of the cylinder or coffer, and, consequently, the only workmen who will be working in a compressed atmosphere will be those who are digging or removing the earth or materials at the bottom of the coffer, and they will, when they have filled a bucket, place it under the lower end of the pipe, and attach it to a chain or rope, when the full bucket will be raised up through the water in the pipe. *Patent completed.*

3227. G. H. BIRKBECK. *Improvements in the arrangement of traction and connecting apparatus for railway carriages and trains.* (A communication.) Dated Dec. 24, 1861.

This invention is not described apart from the drawings. *Patent completed.*

3228. T. SIMMONS. *Certain improvements in urns or vessels for holding and supplying hot water, tea, coffee, or other liquids, separately or conjointly, as also in the stands for the same.* Dated Dec. 26, 1861.

This consists in so dividing the interior of the urn that tea, coffee, &c., may be held in separate compartments, the taps, &c., being arranged for drawing off and supplying the various contents. The patentee proposes supplying heat from a light suitably placed below the body of the urn, the light of which is appropriated for the illumination of transparent pictorial designs suitably placed around the base or stand. *Patent completed.*

3229. J. JONES. *Improvements in the manufacture of lead, tin, and other metals of a like nature, fusible at a low temperature, into sheets of any thickness or length.* Dated Dec. 26, 1861.

This apparatus consists of a cylinder of iron, heated by surrounding the external vertical side thereof with a fir or otherwise. This cylinder contains the molten metal, and is placed immediately above a hydraulic press, the head of the ram of which forms a piston, working within the cylinder, which is used to force out the metal through a die or dies fitted on to the top of the cylinder. These dies may be kept cool by a current or currents of water passing through internal passages in them. The sheets of metal as ejected are received on rollers, and are immediately ready for use. The metal for supplying the cylinder is melted in a vessel placed above the cylinder, and communicates therewith by a pipe. *Patent completed.*

3230. T. STANDING. *Improvements in cinder-sifters and ash receptacles, applicable to domestic fire-grates.* Dated Dec. 26, 1861.

Here the patentee places beneath an ordinary stove a combined cinder-sifter and ash receptacle, the sifter being composed of woven wire work, or perforated metal plate, and supported on a frame which can slide to and fro on fixed rods extending across the ash-box, at a slight elevation from the bottom thereof. A knob or handle in front of the grate or stove, and connected by a short rod with the supporting frame of the sifter, serves to impart a to and fro shaking or vibratory motion to the sifter when requisite, whereby the ashes are collected in the ash-box beneath. *Patent completed.*

3231. L. J. TAULIN. *A wind musical instrument, "Taulin's harmonicor."* Dated Dec. 26, 1861.

This consists in the construction of a portable wind instrument, with free reed stops, with which all kinds of music may be performed. This instrument the inventor prefers to make of metal. The notes are formed by pistons, and from the chromatic gamut the number of notes on the instrument can be greater or less as desired. The mouth-piece is in the form of a small beak; there are two hooks in which the left hand is placed to hold the instrument, so that the right hand can move the pistons to sound the notes desired. The notes emitted at the same time by the instrument can be retained in any number in order to produce chords. *Patent abandoned.*

3232. J. SCHLOSS. *Improvements in envelopes for containing photographic pictures and portraits.* (A communication.) Dated Dec. 26, 1861.

This invention consists in forming envelopes intended chiefly for containing "carte de visite" portraits and for their being forwarded conveniently by post, as hereafter described. The inventor takes a sheet of paper or paper cloth or other material suitable for envelopes, and of a breadth equal to the length of the envelope when finished. He forms the usual flap at one end of the paper, and forms a frame in or on the opposite end, either by folding the paper over on itself, or by the employment of a separate frame of paper. In the first case, that is where the paper is folded over, he first cuts the "window" or aperture therein for showing the picture, and cements the top and bottom edges to the other part of the sheet; one side will thus remain unattached for the insertion of the picture. Where the frame is in a detached piece, he attaches it at top and bottom and one side. After insertion of the picture, that part of the sheet on which the frame is applied, together with the picture and frame, is folded over, and the flap is folded over the back of that part on which the frame is applied. When several pictures are to be enclosed, he uses a greater length of paper, and applies additional frames, and where only two pictures are to be enclosed, he applies an additional frame on that part of the paper which, when the envelope is folded, covers the face of the first picture. *Patent abandoned.*

3233. N. A. BURNIER. *Improvements in the manufacture of lace.* Dated Dec. 26, 1861.

The lace produced by the invention is dedominated by the inventor Bandanah lace. It is manufactured upon ordinary lace looms, the peculiarity of it being that it is almost entirely composed of spun silk of such a description as will best receive colours, the brightness of which almost assimilates this material to ordinary silk. *Patent abandoned.*

3234. J. SHEPHERD. *Improvements in apparatus for cleansing steam boilers.* Dated Dec. 26, 1861.

In order to collect, carry off, and discharge the sludge, sediment, and scum contained and formed upon the surface of the water in steam boilers, particularly during ebullition, the patentee employs one or more floating receivers made buoyant by air-tight chambers, balance weights or other suitable means to render them moveable. These receivers are adjusted to any given distance below the surface of the water, and are connected to the water pipe or pipes by tubes within each other, similar to a telescope, or by jointing one tube so that it can work in and over another tube, in order that the receivers may rise or fall with the surface of the water, the collected refuse being discharged from the receivers and waste pipe or pipes by taps, valves, or other suitable means. In order to expel from the boiler such sludge, sediment, or other matter that may fall to the bottom part of the shell or framework of the boiler, he employs one or more vertical or other shaped pipe or pipes fitted with a nose, perforated disc, or conical mouth piece; these pipes are under sludge extractors are connected to the main waste pipe. The whole area of the openings into the said main pipe is to equal, but not to exceed the area of the said main or chief waste pipe. *Patent completed.*

3235. R. NEEDHAM. *Improvements in apparatus for cleansing steam boilers and lubricating the pistons of steam-engines, and for an improved steam trap.* Dated Dec. 26, 1861.

For cleansing steam boilers, the patentee places in the exterior of a boiler a pipe extending longitudinally from end to end, and connected at one end to a vertical pipe communicating with a cock or valve on the outside. The said pipe is placed at the bottom of the interior of the boiler, or at some distance above it, and has connected to its top a number of vertical pipes, each opening in the shape of a funnel at the level of the water. The said funnels face the front or firing end of the boiler, so that the scum shall, of necessity, enter them in consequence

of the heat at the front end of the boiler, causing the flow of water towards the back. The scum, after entering the funnels, passes through the longitudinal and vertical pipes to the cock or valve on the outside, which is opened, when required, to let off the scum. *Patent completed.*

3236. H. DAWES. *An improved metal for crinolines.* Dated Dec. 26, 1861.

This consists in subjecting the steel to a process of electro-typing with an inferior metal, such as zinc, copper, tin, brass, by which the steel will withstand rust or corrosion from the atmosphere, and will maintain a bright and smooth surface. *Patent abandoned.*

3237. J. N. PALMER. *Improvements in cooking stoves and ships' ranges.* (A communication.) Dated Dec. 26, 1861.

This consists in the introduction of a flue at the back of the stone with the view of increasing the draught, and allowing the heat to pass all round the ovens and up the chimney or pipe, thereby heating the bottom of the ovens as well as the top. Also in supporting the stove pipe by means of a separate cast-iron oblong pipe attached to the back of the stove, to allow the top or hot plate to be removed for the purpose of cleaning out the flues without taking down the pipe. Also in the introduction of a cast-iron perforated fire-back or shield in the fire-pot, with the view of allowing the air to pass up from behind, increasing the draught, protecting the fire-pot, and permitting the fire-back to be replaced when burnt out without removing the fire-pot. *Patent completed.*

3238. W. HAWKSWORTH. *Certain improvements in carding engines.* Dated Dec. 27, 1861.

This consists of apparatus for stripping the fleece off the doffer of a carding engine. The stripping comb is made of several pieces screwed or otherwise fixed to a back or stock, made of hollow sheet metal of a semi-circular shape, in order to combine strength with lightness. The comb and stock are guided up and down by rods working in fixed bearings, and they are put in motion by a crank, eccentric, or cam, the side links from which are connected to the trunnions on which the comb swivels, so that the teeth of the comb in the down stroke are sufficiently near the doffer to strip off the fleece; but in the up-stroke they are moved slightly from the doffer, and thus clear the wires. *Patent completed.*

3239. T. SILVER. *Improvements in apparatus for governing or regulating the speed of steam and other engines.* Dated Dec. 27, 1861.

This consists in taking advantage of pneumatic resistance, to the motion of mechanical apparatus of various forms and arrangements, in which the reacting force or power may either be a spring or suspended weight, and also the accumulation of pneumatic force as a power operating against a re-acting spring or counter-weight. The first arrangement refers to rotary apparatus or instruments, and the second to the accumulation of force within closed vessels. *Patent completed.*

3240. W. TURNER and T. W. GIBSON. *Improvements in rolling bridges.* Dated Dec. 27, 1861.

Here the patentees construct the platform or roadway by combining two or more trussed girders, by preference of wrought-iron, or of wrought and cast-iron combined, although they may be constructed of wood and iron-plated. The underside of the girders form longitudinal rails which run upon bearing rollers, erected upon a centre pier or quay-wall, about the middle of the length of the bridge, or on the tail pit-side of the opening spanned by the bridge. They mount the bearing-wheels, whether there be two, three, or more of them in the width of the bridge, on a pier or other suitable foundation, in such position as to be about the centre of the length of the bridge, or rather nearer to the overhanging or forward end of the platform, and by longitudinal bearing rails of suitable section, fixed to the under side of the platform, at such an angle or inclination as shall best suit the particular application or the dimensions of the bridge. These rails support the overhanging end of the bridge, whilst a back (or there may be more than one) is fixed parallel with the bearing rails, and at the same angle or inclination. For the purpose of opening and closing the bridge, or moving the platform backward and forward, a pinion mounted upon a horizontal shaft is made to take into the rack, and motion is communicated to the horizontal pinion shaft by any of the ordinary wheel gearing or arrangements used for such purpose, so that the bridge may be opened from any convenient part. *Patent completed.*

3241. P. A. LE COMTE DE FONTAINE MOREAU. *Improvements in treating fatty and resinous bodies, either in a neutral or acid state.* (A communication.) Dated Dec. 27, 1861.

This consists in the treatment of fatty and resinous bodies with intramidine, a substance composed of a mixture of potash, flour, and nitric acid, in preference to any other compound capable of forming nitrous vapours or gases, it having the property of hardening fatty bodies without colouring them too much, and of disinfecting them, and especially of favouring more than any other agent the production of elastic acid. *Patent completed.*

3242. T. BRIGHT. *Improvements in machinery for cutting hay, straw, and other vegetable substances.* Dated Dec. 27, 1861.

This consists, 1, in supporting the top, or rising part of the mouth piece of chaff-cutting machines, and other machines of the like nature, with radius bars which guide it in its upward and downward motion, and which also form the bearing for the axis of the top feed roller. The object of this part of the invention is to form an expanding mouth piece to keep a uniform pressure on the hay, straw, or other vegetable substances to be cut according to the depth of the feed. The invention consists, 2, in passing a spindle across the mouth piece of the machine on which is placed a small toothed pinion, that works into an internal toothed wheel fixed on the axis of the bottom feed roller, by which means the spindle and bottom roller are made to revolve towards the mouth; on the cross spindle the other end is a toothed pinion working into a toothed wheel to give motion to the top feed roller, the ross spindle being worked in the usual way with a spur wheel. It consists also in making the bottom of the feed trough for chaff-cutting machines, &c., of an endless haircloth, or other suitable material, to revolve on two rollers fixed in the feed troughs to take the hay, straw, or other vegetable substances to be cut into the feed rollers of the machine. Motion is given to the haircloth, or other suitable material, by fixing a pulley on the axis of the front roller in the feed trough, the pulley being worked by a strap passing over it, and over the ring of the internal toothed wheel on the axis of the bolt roller. *Patent completed.*

3243. T. W. ATLEE. *Certain improvements in cocks or taps, for drawing off fluids.* Dated Dec. 27, 1861.

This consists in forming cocks or taps for drawing off fluids, with a spiral groove or thread, or grooves and threads, around the shank of such taps, or that part that passes through the cork or wood of the vessel into the interior. *Patent completed.*

3244. W. E. NEWTON. *Improvements in steam generators.* (A communication.) Dated Dec. 27, 1861.

This steam generator is constructed on the principle of injecting a small quantity of water on to a heated metallic surface, thereby flushing it with steam. *Patent abandoned.*

3245. J. MCINTYRE. *Improvements in bomb-shells and similar projectiles.* Dated Dec. 27, 1861.

This invention is not described apart from the drawings. *Patent completed.*

3246. R. A. BROOMAN. *Improvements in steam generators, and in fire-bars employed therein.* (A communication.) Dated Dec. 27, 1861.

This invention relates to a previous patent, dated 5th November, 1861 (No. 2778). The first improvement consists in a new form of joint for closing the aperture made in the fire-box for connecting the water vessel in the fire-box with the water and steam spaces in the boiler. The second improvement consists in carrying the pipes and the joints whereby communication is effected between the said water vessel and the boiler proper outside of the fire-box, and in providing plugs which admit of removal, for allowing the insertion of tools for cleansing the interior of the water vessel. The third improvement consists in an arrangement of fire-bars in steam boiler furnaces. The joint consists of a plate or tube with double flanges. The plate or length of the tube occupies the space between the fire-box and the outer skin; one of the flanges is rivetted to the fire-box and the other flange to the skin. The water vessel is connected to the outer flange, and is independent of the fire-box, with the sides of which it does not come in contact, and, as before stated, the connecting joints to the boiler proper are all made outside of the fire-box. The fire-bars are composed of fixed and moveable bars, the ends of which overlap. The overlapping ends are supported upon one cross-bar. The other ends of the moveable bars are held upon another support, which is connected by plates to the cross-bar in such manner that they may be made to pivot around the cross-bar; the pivotting is effected by means of levers united to vertical rod under control of the attendant. Furnace bars, arranged as before described, possess the advantages of exposing along their whole length spaces for the admission of air between them, while the moveable part allows of the discharge of the fire, of the clinkers, and other residue when required. *Patent completed.*

3247. J. J. H. FAJOLE and P. A. AGOSTINE. *An improved composition or improved compositions suitable for painting, varnishing, and coating.* Dated Dec. 27, 1861.

These compositions are composed of essence of turpentine, caoutchouc, sulphate of zinc, and copal resin in certain proportions. *Patent abandoned.*

3248. J. W. HARLAND. *An improvement or improvements in the manufacture of wood and other types or substitutes therefor, or furniture used by letter-press printers.* Dated Dec. 28, 1861.

This relates to the material of which the types or furniture used by letter-press printers are to be formed, and also to the process of manufacturing the same. The inventor takes paper, or the pulp of paper, which is made from horn raspings or shavings, bone dust, wood shavings, or sawdust, of the same or other substances in a state of communition. A quantity of one or more of the above substances being provided, he saturates it with size or fish glue, or other suitable cement. The material thus prepared is next pressed into a matrix of a form to give it the shape of the type or furniture required. Pressure assisted by heat is next applied, which must be sufficiently great to make the material take accurately the shape of the matrix. This operation being performed the type or furniture is removed from the matrix, and after being dried is (if necessary) reduced to the correct size for being used in the printing press. *Patent abandoned.*

3249. E. LORD. *Certain improvements in machinery for preparing cotton and other fibrous substances.* Dated Dec. 28, 1861.

This applies to the feeding apparatus of openers, blowers, scutchers, carding engines, &c., and consists in supporting the feeding trough or concave plate over which the fleece of fibres passes on a centre; the trough is acted upon by a weight or spring, the object of such weight or spring being to press the fibres between the trough or plate and the feed roller, so as to prevent the fibres being drawn forward unevenly by the beater or licker-in, or other revolving drum or roller acting upon them. *Patent completed.*

3250. A. WARNER. *Improvements in the manufacture of hollow articles for military and war purposes.* Dated Dec. 28, 1861.

This consists, 1, in manufacturing hollow, cylindrical, or other forms, with a bottom thereto, from discs or flat pieces of zinc or tinned zinc, each of such hollow forms being raised or produced from one pillar of zinc or tinned zinc by any of the well known processes for stamping, raising, pressing, or "spinning" metals used in the manufacture of hollow metal articles for other purposes. These hollow forms of zinc or tinned zinc thus produced may be made up into oil bottles for millitary purposes by closing the upper part and applying a suitable stopper thereto, screwed or otherwise secured thereon. It consists, 2, in making boxes for containing the fuse used for the use of artillery from paper lined or otherwise with lead or tin foil. *Patent completed.*

3251. M. HENRY. *Improvements in fire-arms, and in adapting bayonets or cutting or piercing weapons thereto.* (A communication.) Dated Dec. 28, 1861.

This invention relates, first, to breech-loading fire-arms, and its principal feature consists in the employment of an improved breech, which the inventor calls an oscillating breech, by which he means a moveable breech, or capable of being oscillated, rocked, turned, or worked on a fixed fulcrum. *Patent completed.*

3252. J. P. DORMAY, J. S. AIKENHEAD, and S. JOHNSON. *Improvements in the construction of boats for sailing or rowing.* Dated Dec. 30, 1861.

The object here is the attaching or jointing the planking or skin of a sailing or rowing boat, such improved mode being styled by the patentees "flush clenchwork," with bent timbers or ribs, formed by preference in one length or, piece from gunwale to gunwale, so as to obtain great strength combined with extreme lightness and neatness. For this purpose, instead of the edges of the planks being put together square and then caulked, as hitherto practised in building "carvel boats," each edge of each plank, according to these improvements, is bevilled and fitted together, then nailed and clenched at certain intervals, a washer being placed by preference over the point of each nail before clenching it, by which not only a flush or smooth skin is obtained to the boat, but great strength secure joints without caulking, lightness, less resistance in passing through the water, and more correct outline is obtained than by the methods in use for this purpose; and in the application of these improvements to boats of light construction great advantages are derived owing to the facility with which they can be repaired. They prefer to steam or heat the planks in order to shape or form them to the outline of the boat when applying them thereto. *Patent completed.*

3253. J. EDWARDS. *Improvements in the permanent way of railways.* Dated Dec. 30, 1861.

This consists in making railway chairs with an opening sufficiently wide to take the head of the rail. The inventor then takes a filling piece, which fills up the channel of the rail; these filling pieces are placed in the channels of the rail, and the rail is then dropped into the opening in the chair, and is held fast with or without wedging. These chairs are made either of cast or wrought-iron. The invention consists also in making suitable projections in the sides of the rails, which projections fill up the opening in the chair, it being only necessary to drop the said rail into the chair, and it is held fast with or without wedging. Also in placing a cushion of gutta-percha, india-rubber, cork, &c., in the bottom of the chair, so that the concussion is broken while a train is passing, and the bottom of the rail prevented from being injured. Also in making the spike or hold holes in railway chairs obliquely. *Patent abandoned.*

3254. F. TOLHAUSEN. *Improvements in machines for reaping, gathering, and binding harvest produce.* (A communication.) Dated Dec. 30, 1861.

Provisional protection has not been granted for this invention. *Patent completed.*

3255. J. GORTON and B. HENDERSON. *Improvements in the manufacture of ropes.* Dated Dec. 30, 1861.

The patentees claim the use of coal, either alone or mixed with tar in suitable proportions in preparing the hempen yarn of which the rope is made. *Patent completed.*

3256. G. H. BIRKBECK. *Improved apparatus for raising or forcing water or other fluids.* (A communication. Dated Dec. 30, 1861.

This invention refers to a previous patent dated 22nd. Sept., 1860 (No. 2318), and is carried into effect as follows: —Above the water chambers is placed a valve box having three branches, one to each of the water chambers, and the other connected to the pipe leading to the air pump or pumps; within such valve box is a valve, which it is preferred to call the reversing valve, capable (by means of a system of levers and rods) of being actuated by the engine, so as to open or close the communication between the air pump or pumps, and one or the other of the water chambers, the compressed air being directed on to the surface of the water in one of the chambers, so as to displace the water contained therein, and cause it to flow up the up-cast pipe to the height required. When the water has been nearly all discharged from the chamber which is for the time being in communication with the air pump, the engine acts on the reverse valve and causes the compressed air to act on the surface of the water contained in the other chamber, which has been filling with water during the time of the discharge of the contents of the first mentioned chamber. By this arrangement the air in the pipes between the air pump and the chamber, when once compressed, is kept at the density or pressure equal to the weight of the column of water to be lifted. On the top of each chamber an air escape valve is fixed to allow the air to escape in order that such chamber may refill with water. *Patent completed.*

PROVISIONAL PROTECTIONS.

Dated May 17, 1862.

1504. C. H. Tessier, Paris, gentleman. A new safety lock. (A communication.)

Dated May 23, 1862.

1559. J. Ward, Radford, Nottingham, machine builder, and J. Dewick, New Lenton, Nottingham, machinist. Improvements in machinery or apparatus for the manufacture of textile or looped fabrics.

Dated May 27, 1862.

1582. C. A. M. Durand, Penjard, St. Andre de Cubzac, France, a new kind of water-mill.

Dated May 31, 1862.

1641. A. Moreau and A. E. Ragoon, Bernard-street, Russell-square. Improvements in electro-magnetic machines or apparatus.

1651. W. E. Newton, 66 Chancery-lane, C.E. Improvements in the treatment of cloth and other textures, leather, or animal tissues, for the purpose of rendering them more durable and impermeable to water and other fluids, and for producing from any firm fibrous texture, such as cloth, cotton, woollen or mixed goods, a durable artificial leather. (A communication.)

1653. W. E. Newton, 66 Chancery-lane, C.E. Improvements in the construction and operation of shot proof gun towers, and the working of the guns therein for sea vessels, floating harbour defences, forts, or land fortifications. (A communication.)

Dated June 4, 1862.

1691. E. Conroy, Boston, U.S., machinist. Improved machinery for cutting cork, bungs, and such like articles.

Dated June 5, 1862.

1695. R. Robinson, 18 Fish-street, Hull. Improvements in fire-escapes, parts of which improvements are also applicable to other purposes.

Dated June 10, 1862.

1725. T. Lister. Hipperholme, near Halifax, plasterer and splint manufacturer. Improvements in the material to be employed for address cards, visiting cards, labels, railway tickets, and other similar articles, whether for printing or writing upon.

Dated June 13, 1862.

1762. J. Bermingham. Cork. Improvements in the construction of vessels of war, parts of which improvements are also applicable to the construction of vessels for commercial and other purposes.

Dated June 16, 1862.

1778. F. M. Lanoa, 4º Boulevart Mont Parnasse, Paris, engineer. An improved geodetic or topographic instrument, intended to combine in one all the instruments now used in surveying.

Dated June 17, 1862.

1792. M. Turner, Wigston, lieutenant-colonel in Her Majesty's volunteers, and E. T. Loseby, Wood-street, City, horologist. Improvements in small arms and ordnance, and in sights for the same, part of which may be used for measuring distances.

Dated June 19, 1862.

1802. W. Clark, Quadrant-road. Highbury-new-park, Islington, engineer. Improvements in the manufacture of that kind of boxes known as dry goods boxes.

Dated June 20, 1862.

1814. W. Jeffries, West Bromwich, Stafford, manager of iron works. A new or improved rail for railways, and a new or improved chair or sleeper for the said rail.

1820. D. Adamson, Newton Moor Iron Works, Newton Moor, Chester, and L. Leigh, Saint Petersburgh, Russia, cotton spinner. Improvements in the construction of steam boilers, and in apparatus connected therewith, part of which is applicable to shipbuilding.

1284. C. Osman, Chryssell-road, Brixton. Improvements in the manufacture of elastic or yielding surfaces for sitting, lying, or reclining upon, part of which improvements are applicable to other purposes.

1826. G. Gray, Whitburne, Linlithgow, N.B., coal and lime master, and D. Cunningham, manufacturing chemist. Improvements in applying a new material to be used as a substitute for the "blackening" or other materials employed in casting or moulding metals.

Dated June 21, 1862.

1828. F. E. Schneider, Paris, and J. Snider, jun., America. Improvements in the construction of breech-loading fire-arms.

1830. J. Taylor, Oldham, cotton spinner. An improved "doffer" or "stripper" for carding engines for preparing cotton and other fibrous substances.

1838. F. Tolhausen, C.E., 17 Rue du Faubourg Montmartre, Paris. Improvements in apparatus for preventing collisions on railways. (A communication.)

1840. J. Lawson, 2 Morris-place, Glasgow. Improvements in the manufacture of carpets and other piled fabrics.

Dated June 23, 1862.

1842. T. Wilson, Birmingham, engineer and gun manufacturer. A new or improved dress fastening, which said fastening is also applicable to the fastening of bands and belts in general, and to other like purposes.

1846 A. Webster, Arbroath, N.B., blacksmith. Improvements in machinery or apparatus for boring slate.

1848. R. Cook, Finsbury-place, South, pianoforte-maker. Improvements in the construction of pianoforte actions.

Dated June 24, 1862.

1852. T. Desgrandschamps, 71 Rue de Charenton, Paris, mechanician. A new mechanism of distribution with motion from the rod, applicable to any kind of steam-engine.

1854. W. Bayliss, flat and chain cable and iron hurdle and fencing manufacturer, Monmore-green, Wolverhampton. An improved strainer for straining and tightening wire for fencing and other purposes.

1856. G. Gray, Greenwich. Improvements in the manufacture of wheels.

1858. W. Clark, 53 Chancery-lane, engineer. Improvements in hernial and other orthopedic apparatus, and in pessaries and other instruments. (A communication.)

Dated June 25, 1862.

1860. S. Brooks, Union Mills, Manchester, machine-maker, and S. Denton, Oldham, mechanic. Improvements in machinery for spinning and doubling.

1862. W. Clark, 53 Chancery-lane, engineer. Improvements in ploughs. (A communication.)

1866. C. C. Steenstruf, Norway. An improved economical can or vessel for containing and delivering lubricating or other fluids.

1870. J. David, 20 Rue St. Fiacre, Paris. An improved dynamometer for ascertaining the relative strength and elasticity of various kinds of threads and ropes.

1872. W. Clark, 53 Chancery-lane, engineer. Improvements in apparatus for raising the nap on cloth and other fabrics. (A communication.)

Dated June 26, 1862.

1874. G. Peterson, Brompton-square, actual counsellor, Russia. Improvements in apparatus for ascertaining the quantity and strength of spirits or other products obtained by the process of distillation. (A communication.)

1876. J. Parkes, London-street, Paddington, gas engineer. Improvements in gas lanterns.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1894. M. A. F. Mennons, 24 Rue du Mont Thabor, Paris. Improved means for the prevention and reduction of synovial and other swellings or tumours in the limbs of horses. (A communication.) Dated June 21, 1861.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

502. J. Piddington. Shelling or husking grain. (A communication.)

514. H. W. Cook. Propelling carriages and vehicles by means of electricity.

523. T. King and R. Varvill. For controlling the flow of fluids.

524. J. Cliff. Glazing earthenware.

525. W. Miller. Manufacture of sugar.

526. C. L. Knoll. Pianofortes.

530. J. Medhurst. Reefing and furling sails.

532. G. Torr. Manufacturing and reburning animal charcoal.

536. W. Smith. Making cigaretts. (A communication.)

541. J. R. Foster. Manufacture of bullion fringe or cord.

542. W. S. Wood. Regulating the flow of steam.

546. A. W. Makinson and W. F. Batho. Locomotive engines.

547. J. C. Ratliff. Covers or bindings for books.

548. G. McKenzie, W. F. Murray, and J. Hamilton. Manufacture of bobbins.

551. R. A. Brooman. Manufacture of hats and bonnets. (A communication.)

557. M. Dodd. Shearing or cutting metals.

582. W. Conisbee. Colour printing machines.

585. J. Gjers. Moulds for casting.

589. J. T. Smith. Measuring angles.

591. A. J. Sedley. Folding chairs or seats.

592. G. H. Cottam and H. R. Cottam. Horticultural buildings.

594. G. F. Cuy. Electro magnetic motive power engines.

597. J. and R. M. Somervell. Manufacture of boots and shoes.

601. E. Partington. Manufacture of paper.

616. R. Restell. Connecting and disconnecting carriages and engines.

628. P. J. Guyet. Water meters.

642. W. Spence. Projectiles. (A communication.)

643. W. J. Bennett. Solution or preparation to be used with cements.

645. W. S. Nosworthy. Pianofortes.

646. A. Barclay. Traction engines.

690. S. V. Bonneterre, C. T. Erhart, and J. F. Monti. Regulating the pressure of steam.

743. T. Waller, Breech-loading fire-arms.

744. T. Myers. Measuring fluids.

813. B. Fleet. Bottling soda water.

815. E. Morewood and A. Whytock. Coating metals.

825. E. Morewood and A. Whytock. Shaping iron.

830. L. de La Peyrouse. Preservation of animal substances.

899. L. B. Schmolle. Construction of crinolines.

913. H. Smith. Apparatus used when casting iron or other metal.

959. G. Moulton. Engraving rollers.

1078. G. Fell and W. Haynes. Manufacture of leather.

1147. A. Parkes. Manufacture of rollers for surface printing and embossing.

1149. A. Parkes. Surface condensers.

1395. J. Oxley. Mashing and sparging in breweries and distilleries.

1480. G. Haseltine. Churns. (A communication.)

1604. H. Saunders and J. H. Miles. Venetian blinds.

1611. J. Hirst and J. Wood. Stereoscopic apparatus.

1651. W. E. Newton. Treatment of cloth. (A communication.)

1653. W. E. Newton. Shot-proof gun towers. (A communication.)

1657. A. J. Sax. Drums.

1663. J. Whitworth. Shells.

1731. J. Alison. Agricultural implements.

1798. J. H. Johnson. Projectiles. (A communication.)

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed July 4, 1862.

28. J. W. Arundell.
31. J. Howden.
37. A. Warner.
40. G., G. W., and J. Betjemann.
43. F. Brown.
44. F. Shaw.
45. J. Higgins and T. S. Whitworth.
46. J. Tatham.
48. A. Wallis and C. Haslam.
51. A. Heath.
56. H. Bessemer.
57. W. Bradshaw.
58. H. Cook.
59. C. W. Siemens.
60. J. Smith and S. Wellstood.
63. D. Wilson.
65. D. Wilson.
67. R. A. Brooman.
72. R. Johnson.
73. M. Wigzell.
75. J. Oates.
90. F. C. Warlich.
123. T. Myers.
155. H. B. Barlow.
494. T. Partridge.
870. R. Lublinski.
893. J. P. Woodbury.
967. W. E. Newton.
1164. J. C. Amos.
1190. C. E. Heinke.
1199. J. F. Allen.
1340. J. H. Johnson.
1349. B. Cooke.
1422. J. H. Johnson.
1505. E. J. Bridell.

Sealed July 8, 1862.

83. J. White.
85. T. Scott.
91. T. Soar, J. Belshaw, and M. Soar.
92. J. Parker, J. Wells, and B. Wells.
94. R. A. Brooman.
113. W. Cleland.
114. T. Timmins and T. Simmons.
125. J. M. Rowan.
147. E. C. Nicholson.
156. G. T. Bousfield.
167. A. J. Beer.
175. H. Owen.
203. A. Samuelson.
205. J. Lillie.
228. R. Bodmer and W. Wilson.
438. J. Nasmyth.
419. G. F. Lee.
500. J. Woodrow.
712. W. Clark.
720. H. Y. D. Scott.
735. B. Todd.
736. W. Barford.
1187. A. V. Newton.
1343. T. Cabourg.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1569. N. Ardaseer.
1572. E. A. Wood and M. D. Rogers.
1586. J. Simon.
1604. C. Hagan.
1627. D. Mathews.
1629. W. H. Harfield.
1630. H. Brinsmead and J. Lawrence.
1639. C. Iliffe.
1647. W. E. Newton.
1695. W. H. Harfield.
1726. W. H. Harfield.

PATENTS ON WHICH THE SEVENTH YEAR'S STAMP DUTY HAS BEEN PAID.

1499. R. Muckelt.
1502. R. Tidmarsh.

LIST OF SPECIFICATIONS PUBLISHED

During the week ending July 5, 1862.

No	Pr. s.	Pr. d.	No.	Pr. s.	Pr. d.	No.	Pr. s.	Pr. d.	No.	Pr. s.	Pr. d.	No	Pr. s.	Pr. d.	No.	Pr. s.	Pr. d.
2961	0	3	2972	0	3	2983	0	3	2994	0	5	3005	1	7	3016	0	5
2962	0	3	2973	1	4	2984	0	3	2995	0	5	3006	0	9	3017	0	3
2963	0	3	2974	0	3	2985	0	3	2996	0	3	3007	0	5	3018	0	3
2964	0	6	2975	1	1	2986	0	3	2997	1	7	3008	1	4	3019	0	3
2965	0	3	2976	0	6	2987	0	3	2998	0	3	3009	0	6	3020	0	3
2966	0	3	2977	1	6	2988	0	3	2999	0	6	3010	0	3	3021	0	3
2967	0	3	2978	0	5	2989	0	10	3000	1	4	3011	0	3	3022	0	9
2968	0	3	2979	0	9	2990	0	5	3001	0	5	3012	0	6	3023	0	3
2969	0	10	2980	0	10	2991	0	6	3002	0	7	3013	0	3	...	...	
2970	0	3	2981	1	0	2992	0	3	3003	0	3	3014	0	3	...	...	
2971	0	5	2982	0	3	2993	0	3	3004	0	3	3015	3	11	...	...	

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

PRICES CURRENT OF METALS.

London, July 10, 1862.

		£	s.	d.		£	s.	d.	
IRON:									
Rails in Wales and North of England	pr. ton	6	0	0	to	5	5	0	"
Welsh Bars, in Wales	"	5	5	0	"	5	7	6	"
Staf. Bars, at the Works	"	7	0	0	"	7	5	0	"
" Hoops	"	7	10	0	"	8	0	0	"
" Sheets, Singles	"	9	0	0	"	10	0	0	"
" Nail Rods	"	5	15	0	"	6	10	0	"
" Boiler Plates	"	8	0	0	"	8	10	0	"
Scotch Pig, M.-Nos. Warrants, at Glasgow	"	2	10	6	"	2	14	0	nett
Do. No. 1, Good Brands	"	2	11	6	"	2	15	0	"
Scotch Bars	"	7	5	0	"	7	15	0	"
Swedish Bars, in London	"	10	10	0	"	11	0	0	"
COPPER:									
Sheet and Sheathing	per lb.	0	0	11	"	0	0	0	3
Tough Cake and Tile	pr. ton	98	0	0	"	0	0	0	"
Best Selected	"	101	0	0	"	0	0	0	"
Australian	"	99	0	0	"	0	0	0	"
South American	"	0	0	0	"	0	0	0	"
Yellow Metal Sheathing	per lb.	0	0	9	"	0	0	0	2½
STEEL.									
Swedish Keg	pr. ton	15	0	0	"	0	0	0	2½
" Faggot	"	16	0	0	"	0	0	0	"
TIN:									
English, Block	p. cwt.	6	0	0	"	0	0	0	2½
" Bar	"	6	1	0	"	0	0	0	"
Foreign, Banca	"	6	5	0	"	0	0	0	nett
" Straits	"	5	17	0	"	0	0	0	
TINPLATES:									
Charcoal, I.C.	pr. box	1	7	0	"	1	9	0	
Coke, I.C.	"	1	1	6	"	1	4	0	
LEAD:									
Pig, English	pr. ton	20	0	0	"	21	0	0	2½
" Spanish	"	19	10	0	"	19	15	0	"
Common Sheet	"	21	0	0		0	0	0	"
Ten " (Wimshurst's Patent) A special disct.	"	35	0	0	"	0	0	0	"
SPELTER:									
On the spot	"	17	10	0	"	18	0	0	net
For arrival	"	17	10	0	"	17	15	0	"
ZINC.									
English Sheet	"	23	0	0	"	0	0	0	1
QUICKSILVER	pr. btl.	7	0	0	"	0	0	0	3

JAMES LAURIE, Metal Broker.
50 King William Street. E.C.

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, JULY 18, 1862.

GUNS FOR NAVAL WARFARE.

THERE is hope, at last, of relief for the country from the Armstrong incubus, which weighs so heavily on its finances. Is there another Government in the world, however absolute or despotic, which, during a series of years, would rely for national defence on *one* class of gun, invented, manufactured, proved, inspected, and taken into store by or under the control of one and the same man, who was privileged to dip his hand into the public purse to carry out his schemes for his own benefit, and who had rank and honours bestowed upon him with lavish hand as a recompense for enriching himself and impoverishing the nation, whilst all this time every other gun inventor or manufacturer was excluded from competition and denied even a chance of a fair trial of other classes of guns, which might prove to be better? If a Nicholas or a Louis Napoleon had done such an act, loud would be the outcry amongst our Liberals against the corruption, the jobbery, the tyranny of the Government, which could thus protect a favourite and sacrifice the national interest. There would be dark surmises of connivance with persons in office, and we should bless our stars that there was too much honour and patriotism in public men to render such an abuse possible in this country. We are far from saying that the line of argument we have taken, by way of illustrating in plain terms a national scandal, is strictly applicable to the Armstrong gun contract; but we are quite sure it is high time that the terms of the bargain, and the extraordinary fact that, under any circumstances, it must be enormously remunerative to the inventor, even though his system proved a failure, should be submitted to a searching investigation. It would be hard to find another contract spreading over a number of years under which the Government would be bound to pay a heavy penalty to get rid of a bad bargain. Practically, that is the position in which the War Department stands with reference to the Elswick Company, which is the mechanism for carrying out certain commercial arrangements in which the inspector of artillery could not consistently act in person or in name.

The latest experiments at Shoeburyness have occurred so opportunely to illustrate the conclusions arrived at by Capt. Fishbourne, R.N., of whose paper on "Naval Guns" a preliminary notice appeared in our last number, that we resume the subject in connection with those experiments; and we make no doubt our readers will be satisfied that the terms in which we have deprecated the Armstrong monopoly, and represented the question of naval guns as one highly interesting to the public, are justified by incontrovertible facts and logical conclusions.

We are the more determined to pursue the independent course we have entered upon, when we read in the naval intelligence of the "Times" that "it is ordered by the Admiralty that in "all cases gun-boats shall be furnished *ex-"clusively* with Armstrong guns." Our province is to give a popular exposition of a system of naval guns, based on scientific data, to an extent sufficient to satisfy the professional as well as the general public; that the statements we make are not simply periodical records of the results of experiments, but facts which may be relied upon to regulate the decision of the Legislature in the matter of expenditure on the national defences.

In the words of Captain Fishbourne, "the "question is one of great importance, in an "effective, an economic, and commercial point "of view;" and we may add, that in a mechanical and engineering point of view, it finds an appropriate place in our columns.

In the popular view of the numerous and complex points connected with naval gunnery which it is our duty to present, we will not enter into elaborate disquisitions of scientific questions; but, by stating the conclusions arrived at by contending authorities, we shall render it easy for the unprofessional public to understand the subject.

We find it laid down that "the prime "qualifications for good naval guns are:—1st. "Great initial velocity, no great part of which "must be sacrificed to the rifling. 2ndly. "Simplicity of construction in the gun and in "all its appointments. 3rdly. Muzzle loading, "for safety with high charges. 4thly. Mode "of rifling to be strong and least injurious to "the gun, or easily injured by round shot or "by any other cause, such as loading, con-"stantly in operation. 5thly. Missiles to be "simple, strong, and least liable to injury." Here we have the science of gunnery made easy, and we cannot do better than follow this programme in our argument. But it is unnecessary to discuss details under each of these heads, for in practice they all resolve themselves into the *first*—"initial velocity." Simplicity of construction, muzzle loading, a mode of rifling which shall be made available for round shot, so as not to offer too great an amount of resistance, and missiles simple and strong in form, are all conditions, ably treated by Captain Fishbourne, which tend to carry the first of the *prime qualifications* of a good naval gun into effect.

Initial velocity means the rate of speed with which the projectile leaves the mouth of the gun at the moment of explosion. Its velocity is then at its maximum rate, and declines every second of time during which it travels through the air. The velocity in all cases is in proportion to the charge of powder, but the intensity of the explosion is determined by the resistance the projectile meets with in making its exit from the gun. A round shot fired from a smooth-bore encounters less resistance than a spherical or elongated projectile from a rifled gun. The object of the rifling is to impart a rotary motion to the shot on its own axis, whereby greater accuracy of aim is attained; and that object is effected by causing the projectile to fit closely, so as to arrive at a minimum of windage, and by obstructing its passage out of the gun either by grooves cut in the bore or projections on the shot. But the greater the obstruction the greater the strain on the gun; consequently, assuming the construction and weight of a smooth-bore and a rifled gun to be the same, the charge with which the latter is fired requires to be reduced. In competitive experiments at Shoeburyness, the old 68-pounder smooth bore was fired with the service charge of 16 lbs. of powder, whilst the rifled 110-pounder Armstrong could only be fired with safety with 14 lbs. of powder. If the charge of the latter were increased it would be at the risk of bursting the gun. Here, then, we have the explanation why the initial velocity of projectiles is less from a rifled than from a smooth-bore gun—*the charge must of necessity be less.* This simple fact, for the purposes of naval warfare, entirely overthrows the profound scientific calculations of Sir William Armstrong, and renders his elaborate and expensive system of construction not only useless but detrimental to the public service. Now that this commonplace view of the question is made public by the inexorable logic of facts, it does seem strange to the uninitiated that science did not prove three years ago what a few experiments on iron plates has placed beyond a doubt. Not to embarrass the reader with the details of official tables, one instance will suffice to illustrate the facts stated. In the trial of the Fairbairn target at Shoeburyness, the comparative force of blow from results obtained by measurement was, with the old 68-pounder 5·06, with the Armstrong 110-pounder 2·25, or more than double the effect in favour of the former. At every trial the penetrating and smashing effect of the 68-pounder smooth-bore was found to be considerably greater than the 100-pounder rifled gun. And then it was that Sir William Armstrong, in a carefully elaborate defence of his system, addressed to the "Times," had the simplicity to enunciate for the first time the great truth, that the penetrating effect of a projectile was in proportion to the charge; and the "Times," in a leader, solemnly repeated this truth as a grand discovery. But surely the inventor and the Ordnance authorities ought to have known the fact before they entered on the extravagant course of speculative construction of a new kind of gun.

Sir William Armstrong, after taking two days to prepare his defence and refute Captain Fishbourne's statements at the meeting at the Royal Service Institution, delivered an address which is an admirable specimen of special pleading. He cannot deny the damaging fact of the superior penetrating effect of the 68-pounder smooth-bore, as demonstrated by the figures 5·06 and 2·25, but he declares that "these are "not the usual indentations by any means," and he says, "if we are to take particular in-"stances, there is a target at Shoeburyness, on "which, at 200 yards, the 110-pounder pro-"duced a greater effect than the 68-pounder." Now, the reference to this "particular in-"stance" is hardly candid, because it refers to Mr. Hawkeshaw's laminated target, which, from the defective nature of the system, and having no backing, offers so little resistance, that the pointed and elongated Armstrong bolt, 7 in. in diameter, pierced through the plates more readily than the round 8-inch shot. If there had been any effective resistance, the point of the cone of the Armstrong bolt, which breaks off at the moment of impact, would have produced little or no smashing effect. Sir William then, exercising the skill of the special pleader, travels out of the record, and suddenly shifting the ground of the argument, abandons short ranges, and discourses scientifically on ranges of 670 yards and upwards. This is adroit, but it is not logical. No, Sir William! The question under discussion is the comparative effect of round and rifled projectiles at short ranges, and the particular range referred to is 200 yards, which is a *maximum* distance for ships in action. It is no answer to tell us that at long ranges round shot lose their velocity rapidly, while rifled shot maintain their velocity more effectively. Nor does he point out, what in fairness he ought to have done, that just at the point when the velocity of the two kinds of projectiles is equal and that of the round shot declines, the penetrating force of both is so much reduced that they are innocuous against armour plates. We are talking of the best gun for *naval warfare*, and we have settled the point, that the best gun is that which will produce the greatest effect at short ranges not exceeding 200 yards. It is futile to inform us that for long ranges the rifled gun

has the superiority. True, it carries farther; and for explosive missiles, and especially for field service, there is no denying its advantages, but that is not the point in this discussion. We think it needless to follow Sir William in his defence of the mode of construction of his gun and of the merits of the coil system — *a great fact*, recorded in our last impression, has rendered these points of minor importance. The breech of the 150-pounder, which was said to be an improvement in solidity of construction on the 110-pounder, was blown away. The "Times," prompted, we suppose by the inventor, attributes this misfortune to the gun having been weakened by being fired with a charge of 90 lbs., but that is sheer nonsense. Every gun must be proved, and if it is shaken by the proof, the gun is worthless. The truth is, the construction is defective in principle — it is a mechanical blunder — and we sum up as we began, by saying, "happily for the finances of the country, the prestige of the Armstrong gun is gone." The Minister for War admits that fourteen guns of the same size are ordered; but we cannot doubt that their completion will be suspended.

By a natural transition we pass to the question of floating batteries. In discussing the subject of naval guns, it is impossible to separate the defence from the attack. The power of guns to penetrate or damage the sides of an armour-plated ship must be measured by the force of resistance as well as by the force of impact. It is manifest that the destructive effects of projectiles in future naval warfare will be determined by the strength of the structure to be destroyed.

Reverting to the principles enunciated in this journal for the construction of naval armour, we resume the question of advanced forces for harbour defences.

It is marvellous how the intelligent British public is misled and imposed upon by official assurance and pertinacity, and it is no less surprising that journals which affect to lead public opinion, influenced by political bias, lend their aid to uphold a palpable deception. The Plymouth Sound Fort question rests on absolutely the same foundation as that of the Spithead forts. The point in both cases is whether the defence of the channel leading to the harbour should be a fixed or a floating battery. The few independent members on both sides of the House, who really understood the question, conclusively proved in the debate on the Spithead forts, that it would be waste of public money to erect forts for hypothetical guns, which, if ever they should be produced, could not damage an iron-clad ship at 1,000 yards, and they carried the house with them. On the vote for the Plymouth Sound Fort, Sir John Hay, the chairman of the Iron Plate Committee, who of all other men ought to and does understand the question in all its bearings, pursued the course we ventured to recommend last week. Speaking authoritatively, he showed that at a range of 200 yards no existing gun could stop an iron-clad ship, and that, "according to the most sanguine calculations, not even the 600-pounder about to be made could penetrate the sides of a ship like the Warrior at the distance of 800 yards, which would be the shortest range a hostile vessel entering Plymouth Sound needed to approach the proposed fort; and, moreover, that at a distance of 2,000 yards from it, vessels might take a position to do all the mischief they intended." He pointed out that the only witness recently examined by the defence commission, stated that the intended fort would make an excellent coal depôt, and he derisively remarked, that it was for such a purpose the public money was to be spent, and concluded by maintaining that the sum intended to be thus misapplied should be appropriated to the construction of floating batteries.

Here is an array of sound arguments, not advanced in a spirit of partisanship, but calmly adduced by the chairman of a Government committee, whom the Secretary of the Admiralty so warmly eulogised as a distinguished naval officer of great scientific knowledge, and who, it may be presumed, uttered the sentiments of the committee over which he so ably and impartially presides. And yet this evidence, precisely similar in its facts and conclusions to that which condemned the Spithead forts, is set at naught by the ministers, who, to save themselves from another parliamentary defeat, make a party question of a serious point in our system of naval defence, and induce their adherents to vote away a large sum, which might as well be thrown into the sea, as applied to the construction of a fort inside Plymouth Breakwater. The flunkeys of the press, true to their policy of allegiance to the powers that be, join in chorus to blind the public, and we find on the same day a contemptible attack, in the "Times" and "Daily Telegraph," on independent members who do their duty, the latter journal unblushingly taxing them with an unnatural combination to turn out the ministers and take their places, hypocritically advising that "the electors should begin to watch the way in which some of their representatives do business." The advice is good, but it applies not to those honest members who defend the national purse, but to the system of obstruction and mystification in Government departments, and the corrupt influences in the House of Commons, which render fiscal reform almost hopeless. Let the electors bear these matters in mind, and, when the opportunity of exercising the franchise again occurs, let them exact from candidates a pledge to support administrative reform.

SEWING MACHINES IN THE INTERNATIONAL EXHIBITION.

THE Sewing Machine, to use the phrase of our American friends, has become an "Institution" among us. It is now clearly established that, whatever a needle can accomplish, the machine can do, from the finest and most delicate fabric for female adornment to the heaviest and coarsest habiliments of the sturdy labourer either at home or at the antipodes. There is no doubt that, with respect to sewing machines, many obstacles which bar the progress of a new invention have yet to be overcome. Until lately, there were many persons who never heard of a machine for sewing, and many more who had never seen one. The possibility of any machine doing the minute and exact stitches which needlework by the hand performed, was scarcely entertained; and the most credulous could hardly believe that sewing in any fashion could be done by a needle with an eye at its point.

There were three sewing machines in the Exhibition of 1851. In the Paris Exhibition of 1854 there were fourteen. Professor Willis, in his report of the latter, divides the machines there exhibited into four classes: —

1st. Those wherein the needle is passed completely through the stuff, as with the common sewing needle. These were for embroidery;

2nd. The "crochet," or chain-stitch machine;

3rd. Two-threaded machine, of which one produces the shuttle-stitch; and

4th. Two-threaded machines producing the double chain-stitch.

A machine of the first class was invented and patented in England by John Duncan so far back as 1804. This machine, though intended only for tambouring, had about it something that was suggestive of the sewing machine, and subsequent improvements, such as the eye-pointed needle, brought it nearer to the present perfection of that machine. Stone and Henderson had also patented a machine of the same character in France, in the same year. Several successive attempts to construct a sewing-machine were made both in England and America, of which the principal were Bostwick's in England, and Thimmonier and Hind's in America. But in 1844 a machine was devised by Fisher of Nottingham, which merits some consideration. It raises, in fact, the interesting and important issue: Is the sewing machine an American or an English invention? In a MS. work which we have seen on the "History of the Sewing Machine from the year 1750," by Mr. N. Salamon, and which we hope that gentleman will yet give to the public, the question is thus stated: — "Unquestionably must be awarded to John Fisher, jun., of Nottingham, the rare merit of having originated and invented the combination of threads known as the 'shuttle-stitch,' and the 'interlocked,' or 'chain-stitch;' and there can be little doubt that, had he at that time intended a sewing-machine, he could easily have added, as he did at a later period, the required mechanism for 'feeding' and 'tightening' the stitch. But he was working on the elaboration of a lace-machine — in all probability, the idea of a 'sewing' machine never entered his head — and an exquisite and wonderful lace-making machine he produced, but a lace-making machine only. The praise due to him for his invention, which evinced great genius and mechanical powers of the very highest order, is greatly enhanced by the fact that he was only in his nineteenth year when he perfected it, and there were in it 19,000 separate pieces of mechanism." Mr. Salamon goes on to compare the machine of Fisher with that of Howe, and awards to the latter, what no one will be disposed to refuse him, the credit of having been the first to construct, for all practical purposes, the sewing machine — the one on which all subsequent improvements and modifications have been founded.

It was in the year 1840 that Howe first set himself seriously to construct a sewing machine; and in a lonely garret in Cambridgeport, Massachusetts, during the intervals of labour at his trade and through the hours of the night, the young enthusiast gave his unremitting attention to what had now become the great object of his life. After five years of such toil, he had constructed and finished the first automatic sewing machine for practical purposes. Mr. Salamon, to whom we are indebted for much interesting information about the early struggles of Howe, says: — "A wonderful piece of mechanism to issue from such a workshop! and the triumph of its completion a fitting reward for the genius that had conceived it, and the ingenuity that had carried it to perfection." To test the operating power and practical utility of the invention, two suits of men's clothing, of fine broadcloth, were made by the machine in July 1845; that is to say, all the seaming and stitching work was performed by it, and was

done well and firmly. The stitches, known as the lock-stitch, were made at the rate of one hundred and sixty in half a minute, the average rate of hand-sewing being about thirty stitches in one minute. The machine afterwards, when taken to Boston, obtained even a higher rate of speed. It was worked there daily for two weeks, in a room where some twenty persons were engaged in sewing. They brought portions of their work, such as coat-seams, to the machine to be worked, and the machine did it better and faster than they could have done it themselves. The machine was, in fact, pitted against five girls, the best and quickest workers in the establishment, each girl having one piece of cloth and the machine five pieces, all of the same length, and the seams, which were the inside seams of coat sleeves, also of the same description. The girls sewed much faster than they were in the habit of sewing, and at a rate which they could not have maintained for a day, or even for an hour; but they were beaten by the machine, which was operated by Howe himself and worked by hand. The seaming made by it was the neatest and strongest, and fit for any use in the trade. After going through many struggles and enduring great privations, unhappily the entangling embarrassments of many men of inventive genius, Howe arrived in England in 1847, only to encounter fresh difficulties. His invention had been previously disposed of for the ridiculously small sum of 250*l.*, and patented by Mr. Thomas on December 1, 1846; and Howe came to England, with ulterior hopes, no doubt, but ostensibly to work for the patentee on the construction of his machines at the weekly wages of three pounds. We need not follow him through the bitter disappointments and the prostrated hopes, so well detailed by Mr. Salamon, of his two years' sojourn in England. He returned to America a steerage passenger on board an emigrant ship, and arrived in New York in April 1849, with half-a-crown in his pocket. He soon procured employment as a journeyman machinist, but a letter from his native place in Massachusetts soon sent him thither, where he arrived in time to see the last of his wife, who died in his arms. After his return to America, he became involved in considerable litigation to defend the rights of his American patent. This being decided in his favour, he obtained the power of granting licenses in 1853, but for the following year only fifteen were issued by him. In the five years after, no fewer than 46,023 were granted, and up to September 1860 he had issued 130,000, producing him a net return of nearly 90,000*l.* The chequered life of such a man is in every way most interesting, and we hope yet to see his biography taking its place among others in illustrating the power of self-help, and encouraging other aspirants for distinction amid the tortuous and discouraging part of their career.

Of several other sewing machines patented since Howe's, we may notice Morey's in 1849, who introduced the feed motion, and which is really the groundwork of the present perfected machine. This patent embraces five different machines or modifications. Then there was Hughes, who patented, in 1852, what is now known as the "Lancashire Machine," the feed motion of which was a combination of vertical and horizontal motions, enabling the cloth to be more easily guided by the hand of the operator. In the same year, also, Mr. Belford took out several patents for improvements in sewing machines. Judkin's also was patented in the same year, for improvements which consisted in a vibrating needle, horizontal traversing shuttle, and serrated feeding bar. Dirck in 1853 has a patent for improvements, and, in the same year in America and England, Johnson and Thomas respectively have patents for some novelty, the latter being for a needle and shuttle machine adapted for large manufacturers, the feed motion being based upon that of Hughes. In fact, since the date of Mr. Thomas's patent for Howe's invention, more than 250 patents have been granted in England for "improvements in "sewing machines," a vast majority of which lie buried in the grave of forgotten hopes and misdirected application.

Two years ago, in the pages of this Magazine, we urged upon the machinists of this country to turn their attention to the manufacture of sewing machines, as we foresaw in that an extensive and profitable employment. Just see what they have done in America. In the work by Mr. Salamon, which we have already quoted, he says: "The amount of "property invested in the manufacture of "sewing machines is moderately computed at "$2,000,000. The employment of this capital "provides work for about 8,000 men, besides "an estimated number of 2,000, who are en-"gaged in making machine needles. This is a "business quite distinct from the manufacture "of machines, and is, of course, an entirely new "branch of industry. Another new employ-"ment created by sewing machines, is that of "making machine twist. In introducing the "machines into the tailoring business, much "difficulty was at first experienced, owing to "the want of this necessary article. There are "now numerous manufactories in the United "States exclusively devoted to its production. "They import the raw silk, manufacture it into "twist, and give employment to a great number "of operatives, *chiefly females*. In New York "the sewing machine may also be said to have "created the business of japanning, for all the "machines require to undergo that process. In "1850 there were in that city only two ja-"panners, in a small way of business; there are "now several large establishments employing "a great number of hands."

And then, too, in a purely economical view, the social aspect of work and wages has been marvellously bettered. The number of workmen and workwomen employed since the introduction of the sewing machine has greatly increased. Their wages are much higher, while their hours of labour are considerably reduced. Women especially worked at stitching by hand early and late; now their time is regular, and does not exceed nine hours a day. In the tailoring and clothing business the beneficial effects of sewing machines are very great. On the first introduction of the machine into the trade, the operative tailors combined against it; but as the "outsiders" began to use the machines rather extensively, the regular tailors found themselves forced to adopt it, and the machines are now used more or less in all kinds of tailoring work. The consequence has been that the trade has vastly increased, and the quality of work is both more durable and ornamental than it could possibly have been rendered by hand sewing. The machine has enabled hundreds of tailors and seamstresses to continue at their trade who would have had to turn to something else on account of their sight failing; and hundreds of others, whose health would not admit of sitting a sufficient number of hours to earn a livelihood at hand-sewing, can make a comfortable living by using the machine. To illustrate the advantage resulting to capital from its use, it may be stated that one firm in New York estimate their annual saving in this respect at $75,000. In shirt-making, which is a business largely carried on at Connecticut, one maker employs 400 sewing machines, supplying work for 800 women and 50 men. They make 800 dozen shirts per week. The women earn from $4 to $7 weekly, being one-fourth more than they could earn by hand. The demand for female labour in this branch of industry has been greatly increased by the sewing machine. The mantle and cloak manufacture of the United States is another important branch of female labour which has received great expansion by the sewing machine. In the single city of New York the amount of business done is estimated at $3,000,000 yearly. One machine can do the work of six females, yet, notwithstanding, the number of sewing hands has been greatly increased, additional labour being required to prepare the additional work, and also to finish such parts of it as the machines cannot do. The wages in this trade have also been increased; and, as in the tailoring business, while a greater amount of work is put into the articles made, the cost to the public has been actually less. Hand-sewers earn $4 per week and machine-sewers about $7. The operatives prefer working by machine to working by hand, as it has proved more conducive to their health; and, in fact, it is the delicate females who are chiefly employed on the machines. It may be stated that, in fine sewing, the machine will do the work of four women; in coarser kinds of sewing it will do the work of six women. In fine stitching shirt fronts, it beats hand labour in a much greater proportion. The needlewomen all testify that the introduction of the sewing machine has not affected them any way injuriously; on the contrary, they get full employment in basting. They earn more money, work fewer hours, and their eyesight is not injured, as it needs must be in hand-sewing, from closely watching their work. Tailors, shoemakers, and other operatives of this class also testify to the benefit which the sewing machine has conferred upon them in this important particular. We understand that in 1860 it was ascertained that the United States, with a population of 25,000,000, had in use, probably, not fewer than 200,000 sewing machines, while in Great Britain there were not more, at the highest estimate, than 25,000. In America the estimated cost of plant used in the manufacture of machines is 400,000*l.*, while in Great Britain 5,000*l.* would, in all probability, be beyond the mark. In America there are several large manufactories, each capable of producing from 600 to 1,000 machines weekly, and employing some 5,000 men.

Perhaps the extensive use of the sewing machine might not be signalised in England by such striking effects as in America; but we believe that its introduction into the family, the workshop, and the factory, is a certainty, and, so believing, we shall consider it our duty to popularise them as much as we can.

We have, on several occasions in this Magazine, described their mechanical constructions and need not repeat it here, save where it is necessary in comparing one machine with another, or where any speciality demands consideration. There are about thirty different machines in the Exhibition, each having, or professing to have, some distinctive peculiarity. What those peculiarities are, we will endeavour to make plain to those who are interested in the subject and will follow us through our review, beginning with the machines in the American Court, then taking those in the Processes Court, and, finally, those exhibited in the French Court.

INVENTORS AND THE ADMIRALTY.

"Lot of Inventors.—In the last three years "590 proposals and plans for the purposes of "shot-proof ships have been sent in to the "Admiralty. They were all referred to the "Controller of the Navy and the assistant "officers of his department, and only 105 of "them reached the further stage of being "submitted to a committee or referee; 37 "are still under consideration." So runs a paragraph in the "Jupiter"—a "medium" through which all inventors and their inventions are some day to be handed bodily over to the tender mercies of the public, without judge or jury. As regards the proposals of the "lot" above referred to, it will be seen that between 17 and 18 per cent. only were submitted to that respectable tribunal before which we have been frequently assured, both in and out of Parliament, *all* inventions or plans submitted to the Admiralty were regularly placed. Out of 590 proposals, it appears only 105 reached the "further stage;" the whole of the remainder simply passing through the offices of the Controller of the Navy and his assistants. That these 485 proposals may possibly be all ultimately worthless we do not deny, or even that they may not warrant any very high standard of knowledge in those who pronounce them so, and on whose opinion they are forthwith shelved; but it would still be very interesting to the great body of inventors to know whose plans have been passed to the Committee of reference, and whose throttled in the Controller's offices. If four-fifths of the plans submitted to the Admiralty are so crude, or otherwise worthless, that they can be readily disposed of in the Controller's office by assistants, we cannot help thinking their examination by two or three members of the Committee would involve no serious loss of time, and certainly be far more satisfactory to those giving themselves the trouble to send them in.

We have no doubt whatever that the gentlemen in the Controller's office are men of ability, and desire to fulfil any of the duties required of them with perfect fairness; but we look upon it that a tribunal above all suspicion, and one organised, after considerable delay, expressly to consider propositions made to the Admiralty, should exclusively be employed to decide upon their merits. It would almost seem that the Admiralty have a pleasure in courting criticism on their mode of doing business. They have been assailed so often, and so vigorously, and to a great extent, at least, in former times, so deservedly, that they appear to have permanently "set up their backs," in expectation of continual assaults. They are, however, greatly in error, if they consider that public journalists have any pleasure in finding fault with them where no fault exists. Our duty is very simple, viz. to find out where abuses exist, and to write against them with the view of putting a stop to them. When this is done, we have done, i.e. when we have written a word or two congratulating all parties upon the change, and encouraging them to continue to make useful reforms in accordance with the spirit of the times.

Why should Government departments be for ever at war with the Queen's subjects? Why should not inventors be able to submit their plans to the Admiralty, or to the War Office, with the same certainty in their being fairly and carefully considered on their merits as they would do to any private manufacturer; with the additional security, that no undue advantage would be taken of the confidence reposed in those to whom such plans were submitted? Is this ever done? Is it rather not notorious that a very large majority of those who have sent proposals to these departments have failed to obtain any straightforward or satisfactory reply to their communications, or have ever received any assurance that their plans have even been looked at? Of course the stereotyped forms of reply are not expected to be believed. Mostly, however, they contain neither matter for belief nor disbelief, but simply inform the persons to whom they are addressed that "my Lords are not prepared" to do so and so. Surely, it is due to those who take the pains to send in plans, or even to put down their thoughts upon paper and submit them to a Government Department, to receive some intimation of their communication having been carefully considered, the reason being assigned for its not being considered to fulfil the object intended. During a very long experience with inventors, we have had to tell many of them that their schemes are worthless; but we have never found it difficult in a few words to satisfy them that they are so. If this cannot always be done, they should be put in possession of the grounds upon which an adverse opinion has been found. We say this treatment is justly due to those who send communications to any Government Department, and, unless it can be insured, we are not satisfied but that it would be better to refuse to receive suggestions altogether; or, what would do as well, let it be publicly known that no communications would be attended to at all. This would be honest, at all events, and give the public a notion of the treatment it might expect from its servants.

We sincerely wish we could induce the Admiralty and other Government departments to treat all inventors as they occasionally do some of them: it would be very easy and involve very little, if any, additional trouble. Let them submit *all propositions* to a competent committee, composed of gentlemen, not fettered in their judgements by trade interests of any kind; and let them communicate to the authors of such propositions the decisions of such committee and the exact words used by them. By these means would they obtain the confidence of all persons, and we should soon cease to see the Parliamentary mouthpieces of the several departments so often on their defence. We are not aware that any valid objection could be urged against the publication of a yearly report, giving in outline the various propositions submitted to the several departments, with the decisions and names of the members of the committee to whom they were submitted.

THE IRON WALLS OF OLD ENGLAND.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Letter 17.

The name of inventors of naval armour is legion. No branch of engineering ever produced such a crop of plans. Hundreds, it was stated in the House of Commons, had been addressed to the Admiralty, and the iron plate have had no sinecure. The number contributed by your correspondents is formidable. If all their letters and descriptions, many illustrated by diagrams, were inserted in the "Magazine," there would for some weeks past have been little space left in its columns for other matter. After a careful examination of the whole, I can select only a few for notice. From this time, if any inventor thinks fit to submit his ideas for "Civilian's" opinion, he must not think himself slighted by being unnoticed. The circle of mechanical contrivances for fastening iron plates to ships is so circumscribed, that every plan now brought forward is a repetition, with some modification in form or arrangement, of well-known methods.

Mr. W. Austin, C.E., of Milford, is a prolific inventor. I am obliged by the terms in which he has addressed me — much more favourable than I deserve. I regret I can only briefly notice his communications, which embrace a number of topics. He complains of neglect in official quarters, and probably not without reason. He has sent plans to the Admiralty for "floating revolving steam batteries," and for "fixing armour plates on "timber sides of ships so as to avoid the "cracking of plates and concussion shock or "damage to ships' timbers." Several distinguished naval officers, whose names I am not at liberty to mention, have, he says, bestowed the highest praise on his plans, and advised him "to push his propositions." He has sent for my inspection "a sectional view of a "timber frigate side, cased with armour plates, "and backed with sand." This idea is by no means novel. It has been proposed by other correspondents of the "Magazine," and also, I have been informed, by more than one applicant to the Admiralty. I confess I am not an advocate for this backing. I do not see how it would be possible, even with the "powerful "ramming proposed," to prevent slip through crevices; and I am quite sure no compression would harden the mass sufficiently to prevent the bulging and fracture of the plate when struck. Sand is proverbially shifting. There is no cohesion among the particles. Whatever may be the powers of resistance of a target, it is idle to suppose that a four or five-inch plate cannot be fractured. The plates may be held on and the frame of the ship be protected from penetration, but under the fire of heavy artillery, holes will be made in plates, and out of those holes the sand backing would run out like the sand of an hour-glass. Mr. Austin has paid a visit to the Prince Consort, just launched at Pembroke, "of which," he says, "he can see they are about to make a mess, "by putting armour plates $4\frac{1}{2}$ inches thick "with through bolts on to the oak planking, "without any infill, so that broken plates and "shattered timbers must result;" and I think he is right. Mr. Austin's method of fastening is to fix bars or bearing plates, as he terms them, with convex surfaces, longitudinally outside and over the edges of the armour plates. To secure these "bearing plates," he proposes "bolts four inches in diameter let in "through the ship's sides." The objections to this plan have been repeatedly mentioned in my letters. The holding plates being exposed to impact and projecting beyond the face of the armour plates, will infallibly be smashed, and the shock or jar being transmitted direct to the bolts, the nuts or rivets which hold the points will be broken off. In recommending the use of smaller plates not exceeding a ton in weight, and made of the best iron, Mr. Austin is in the right track, and if he can aid in inducing the Admiralty to adopt that course, he will render a service to the country. He must not be discouraged by rebuffs, but persevere in claiming a trial of his plan.

Mr. H. E. Hutchins has evinced great ingenuity in contriving two plans, of which he has sent drawings; but they involve difficulties of manufacture and construction which would be, I fear, insurmountable. As one mode of

fastening, bars of iron are to be welded on to the armour plates, and large rivets are to be passed through the latter and serve to connect them, by an iron brace at the back, with the welded bars. The other mode is a complicated system of flanges welded to the edges of the armour plates, these flanges being laid hold of by iron bars, which are bent at sharp angles, and finally fastened inside the skin with nuts of a peculiar construction. No provision is made for backing to the plates, which is a serious matter, for the result of the plan is to leave a hollow space between the armour plate and the side of the ship. The inventor frankly avows that "possibly there would be difficulty "in fastening the backing after the plates were "on." As Mr. Hutchins resides in Essex, he would do well to pay a visit to Shoeburyness, to obtain a little practical insight into the difficult subject he has taken in hand, by observing the effects of heavy guns on iron targets.

S. T. C., of Sydenham, does not propose a plan, but he makes some useful suggestions which, although not new, show he has studied and understands the question. He points out what I have often referred to, that no improvement has been made in constructing iron ships so as to give sufficient strength to the structure to carry the heavy weight of armour plates; and thereby he proves that he is, what he says he is, a practical man, having much experience in iron ship building. He observes that the construction "of iron ships should be so ar-"ranged that every piece of metal added to "her should give strength, and that a ship "can be constructed on an improved principle, "which would comprise all the requisites "wanted, combining great strength with light-"ness;" but he does not give his plan of construction.

Mr. E. J. Richardson has patented a mode of constructing armour for ships on the principle of deflection, which he has embodied in the shape of a veritable colossal shield on the classic model of the ancient Greeks, which might be borne by a Titan Ajax, or Achilles. Mr. R. is quite right as to the law of deflection; but the experiments of the iron plate committee tend to prove that the advantages of deflection are obtained by extending the surface of the plate in proportion to the diminution of thickness; so that after all, to attain a given perpendicular height, the weight of the angulated plate will be the same as the vertical plate to resist a given force. Hence no advantage is gained in weight, whilst the angulated form involves great difficulties of construction. Besides, cannon balls at high velocities have an ugly way of their own of penetrating iron plates and smashing fastenings, which seems to set all ordinary laws at defiance. Never were men of science so much at fault as they have been on armour-plating questions. The shields represented by the drawings of the inventor's specification look picturesque, but I fear a 68-pounder would spoil their symmetry.

Mr. Robert Aytoun has a magnificent conception. He would form a floating structure of thick plates, welded together at their edges, adding plate by plate to the massive shell of the vessel. The idea is Homeric, and its execution would require Cyclopean powers; but, as he truly says, nothing would seem to be impossible to the workers of iron of the present day. I can only do what the author of this thought wishes—give it currency by noticing the plan, that its practicability may be considered by practical men.

Mr. D. Dawes, of the Viaduct Works, Crumlin, has sent me a well got-up design of a thorough practical nature; but the mode of securing the armour plates is of the class I term frame fastening, and which I consider objectionable for reasons stated in former letters, which it is not necessary to repeat. It is the Plum and Scott Russell method improved, but so much like Mr. Mulley's, of which there is a notice in my last letter, that they are almost identical. Still there is a difference, and I think in one respect an improvement on Mr. Mulley, inasmuch as in addition to riveting the dovetail-headed angle or T iron ribs, which hold the edges of the armour plates, a screw bolt is introduced (passing through the flange of the rib), which draws the plate to its bearing, after it is in its place. I say nothing about the inventor's wood backing, except that it is to be condemned *in toto*, because that it is not an essential part of the plan. If I understand Mr. Dawes's description rightly, he proposes longitudinal frames external to the skin of the ship, to be formed by riveting girder iron to the internal vertical frames. If it be so, he is forestalled by an invention on that principle which is patented; and his idea of using wood as a backing with the grain end on, is also proposed by another inventor, whose plan was submitted to the Admiralty last year, but which, like many other useful ideas on this matter, lies *perdu* in the limbo of the Controller's department. If Mr. Dawes's plan has not been properly understood in the above remarks, the rectification of any errors he may point out will be inserted in the "Magazine."

Mr. W. H. Taylor, of the Hartlepool Iron Works, suggests that vibration might be obviated, and the armour more securely held to the side of a ship, by two or more layers of plates breaking joint and fastened together by a great number of rivets and bolts, about seven-eighth diameter, only six to nine inches apart, giving a large sectional area to the holding power and diminishing the risk of injury to the fastenings by impact. The same idea occurred to other persons, of whom Mr. Hawkeshaw, the eminent engineer, is one. Under his direction a large target was constructed on that plan, one part being six inches and the other nine inches in thickness. On trial, the result was a complete failure. The number of perforations in the plates proved to be a source of weakness. The shot encountered little resistance; the iron laminæ which made up the thickness of the target yielded successively to the force, the lines of fracture invariably passing through the bolt or rivet holes. Mr. Scott Russell patented the same method two years ago. These engineers, who are great authorities, are not exempt from fallacies. Mr. Taylor will be consoled by finding himself in such good company. In one of my letters there is a description and diagram of Mr. Hawkeshaw's plan.

The plan proposed by Mr. Bertram Mitford, of Cheltenham, of two series of dovetailed plates fitting into each other, one at the back and one at the front; the former, fastened with bolts or rivets to the skin plates, and holding the latter, was patented by Mr. Lancaster, the gun maker, of Bond Street, and proposed for trial by the Admiralty, but abandoned as impracticable.

C. F. T. Y. is welcome to his small *verbal* criticisms. He confirms the law in punching plates, that the power of penetration is limited by the condition that the thickness of the plate must not exceed the diameter of the punch. I acknowledge my error in supposing that C. F. T. Y is equal to a "tour de force;" he is only a "hair-splitter."

Mr. John Rowe's plan, of welding to the back of the armour-plates short tubes, into which holding-bolts are to be tapped, would not answer. They would break off at the thread in the same way as the screw bolts tapped into the back of Mr. Fairbairn's target, which was described in the "Magazine."

Out of a number of other communications two deserve notice, on account of the evidence they furnish of the wide-spread influence of the "Mechanics' Magazine," and of the patriotic sentiment which has induced English mechanics at Melbourne, in Australia, and San Francisco, in California, to contribute their ideas for the protection of the British navy. The former makes some intelligent remarks on elongated and spherical shot for rifled and smooth bore guns. He will have seen this subject fully discussed in your journal since November 15, 1861, which is the date of the last number he had seen when he wrote on April 25. The chief object of the "English Mechanic" at San Francisco is to put his countrymen at home on their guard against the designs of the Americans, among whom he has lived twelve years; and who, he says, "mean, at the first "opportunity, to wreak vengeance on England "for the sympathy she has shown for the "South." He gives extracts from American papers and details, showing the immense preparations making by the United States Government to form an iron clad navy of overwhelming strength.

I now bring my series of letters on "Iron "Walls" to a close. They have attained the object I had in view. They have aided in drawing public attention to the necessity of an invulnerable armour-plated fleet for the defence of this country, and in proving the paramount importance of Government adopting the most perfect modes of constructing iron ships and the armour to protect them. I have to offer my thanks to you, Sir, for inserting my communications, and to a large body of your readers for the kindly manner in which they have appreciated and acknowledged my intentions. My parting word to my countrymen is, "put not your trust in wood." If England is to maintain her independence and command the supremacy of the seas, she must henceforth rely on "Iron Walls Afloat," and make them invulnerable.

A CIVILIAN.

PATENT TOPSAIL SHEET BITS.—Captain Henry Ponsonby, the treasurer of the Conway, a gentleman well known as a scientific seaman, has just patented an invention of practical utility, which is now being exhibited at the rooms of the Mercantile Marine Service Association, in Water Street, Liverpool, of a simple and ingenious construction of topsail sheet bits, which move with the yards, and thus prevent any extra strains either on the slings of the lower yard or topsail sheets when bracing the yards up, as the bits, truss, and slings all work on centres in a perpendicular line. Seamen will see that this simple invention will save very considerable amount of labour, as well as wear and tear, as compared with the old methods of making the sheets fast to bits bolted to a deck beam, reeving the sheets through fixed eye-bolts in the deck or fixed eyes on the mast. By any of these methods, when the topsail is hoisted tight up, the sheets have in all cases to be eased off before the yard can be braced up; thus the benefit is often lost of a *well* set sail in working to windward, particularly in narrow waters. In many cases, under the old plan, the sheets break, or the bolts give way in the deck, and not unfrequently cargo is damaged in consequence. Captain Ponsonby's invention has already been fitted to a ship of one of our most extensive firms, and from its simplicity we are sure will soon become in general application.

An alloy composed of 600 parts copper, 312 of zinc, and 18 of iron, by weight, is said to be very tenacious and capable of being forged.

SOUTH AUSTRALIAN MINES.

Copper has long been the source of South Australia's mineral wealth; and the abundance of it has been as remarkable as that of the gold of Victoria. The principal mines are those of Burra Burra and Jorke's Peninsula. In an account of the colony, prepared by Mr. Frederick Sinnett, of Adelaide, which has just been published, we find that the annual yield of ore of the Burra Burra mine for many years past has averaged from 10,000 to 13,000 tons of from 22 to 23 per cent. of copper; in round numbers, about 2,500 tons of metallic copper, which has been worth to the colony, at the least, 225,000*l.* per annum. Some interesting statistics are given in this little pamphlet respecting the working of this famous mine. The expenditure of the concern within the province since its commencement amounted to 1,640,000*l.*, of which one million alone had been expended in wages. In the year 1859, the number of workmen employed amounted to 1,170; the wages varying, according to the state of the labour market. Common labourers have been paid from 25s. to 40s. per week; miners, from 35s. to 60s.; mechanics, from 42s. to 112s. per week. The Kapunda mine had been steadily worked for years, with handsome results. The first smelting furnace commenced work in December, 1849; but, in consequence of the superior attractions of the gold-fields of Victoria, in the year 1852, causing the men to desert the Kapunda copper mine, the works ceased, and were not resumed till the year 1855. At one time there were only four miners employed. The ores comprise almost every variety, as yellow ore, or pyrites, blue and green carbonates, muriates, grey and black sulphurets, oxides, bell-metal, and peacock ores, and native copper or malleable. The percentage varies much, from 66 downwards. The entire quantity of ore raised from the commencement to the close of the year 1861, was 35,280 tons of 21 cwt., and of an average produce of twenty per cent.

Time only could show whether the mineral wealth of the far north or that of Jorke's Peninsula would be most considerable. How far inland over the surface of Jorke's Peninsula the valuable lodes run is still uncertain; but, even if all the 27,000 acres of mineral claims were to prove available, the greatest distance of land carriage to which the ore would be exposed would be about fifteen miles, as the average width of the entire Peninsula does not exceed twice that distance. It was, however, certain that by far the greater majority of the claims which were so hastily taken out were destitute of copper. The immense yield of the shafts belonging to a Mr. Hughes was no sooner ascertained than sections in the neighbourhood were taken out in the quite vague hope that they might prove equally productive. The mania was, however, a short-lived one, and over many a mile of Jorke's Peninsula, innumerable survey-pegs in the scrub speedily became the only memorials of the excitement that had swept over the district.

The original Wallaroo mines have, however, been so productive as to have entirely changed the face of that part of the country. Two rapidly rising towns, of a population of 3,000, are established where, little more than two years since, there was nothing but a solitary sheep station.

The Moonta mines have also been successful; the ore raised being of a higher percentage than at Wallaroo. Near the surface the ore is chiefly green carbonate, mixed with clay; but at seven or eight fathoms depth it changed to black and yellow ore, interspersed with large lumps of metallic copper, some of them several pounds in weight. The first discovery of these rich deposits was made in May 1861.

The most successful mine, however, in the Jorke Peninsula has been that of the New Cornwall Mineral Association. The leaseholds of this company include fifteen sections of eighty acres each. Arrangements are made for the erection of ore-reducing works at these mines. The ore will be converted into copper by a process recently patented by Mr. R. V. Rodda. In the International Exhibition will be found specimens illustrating this process.

It is said that the whole of the South Australian colony is highly mineralised, and the mines already discovered are capable of affording employment to a very large additional population.

THE ORDNANCE SURVEY.

CONCLUSION.

The 6-inch maps are engraved in sheets 3 feet by 2 feet, the sheets of each county being made to fit together by the marginal lines, so as to form unitedly, if required, a single plan. For this purpose, the co-ordinates of all the trigonometrical points, and of the corners of the sheets of the maps, are computed with reference to the meridian of a central trigonometrical point in each county. The sheet lines are then drawn, and the trigonometrical points laid down on the copper-plates by their co-ordinates, which is done by a very ingeniously constructed machine. The main features of this contrivance are two scales, placed at right angles to each other, and a tracing point, which is made to traverse in directions parallel to the scales. The photographed plans, being traced on thin paper prepared for the purpose with lamp-black, are fitted down by the trigonometrical points, and sheet lines, to the copper-plates, which have been previously covered with a thin coating of wax. The tracings are then rubbed with a burnisher, by which means the lamp-black lines are transferred to the wax. When the tracing is afterwards peeled off, there remains upon the wax surface an outline drawing, sufficient for the guidance of the engraver, who cuts the work into the copper through the wax ground.

Each engraving to the 6-inch scale contains twenty-four square miles, and embraces the same district of country which is contained in sixteen plans on the $\frac{1}{2500}$ scale; the marginal lines are equivalent to one and a half miles and one mile respectively. The latitudes and longitudes are now engraved on the marginal lines of the 6-inch map, as well as on those of maps of a larger scale. The meridianal point in each county being always a point in the grand triangulation of the kingdom, the latitude and longitude of each part are known with complete accuracy, and from these the latitudes and longitudes for the sheet corners of the maps are easily computed.

The 1-inch maps of Scotland and Ireland are laid down on Flamsteed's projection modified, and the sheets of each kingdom will therefore join together to form one map. This, however, is not the case with the 1-inch map of England, which has not been laid down on any projection, but by the method of parallels and perpendiculars to different meridianal lines in different parts of the country. The plans are reduced in this case for the engraver by the pentagraph, or by photography, from the engraved impressions of the 6-inch map, and the tracings are fitted down to the copper-plates by the aid of points previously scored on the copper, in the same manner as described in reference to the 6-inch maps. The distortion resulting from the projection is quite inappreciable in a small area. On the 6-inch engravings, the hill-features of the country to be represented — as being the most difficult portion of the work — are first sketched in, and then are subsequently drawn by skilful draughtsmen on the reduced scale of 1 inch, for the engravers to copy. The contours on the 6-inch map are of great service to the hill draughtsman in regulating his scale of shades, fixing the proper relative importance of the different features, and for giving the exact form of the top of the hill.

The plans of towns are always engraved on copper, and the scale on which they are engraved being five times that of the plans on the $\frac{1}{2500}$ scale, it is arranged that 25 sheets shall be included in one $\frac{1}{2500}$ sheet. The engraving consists of two processes, namely, direct cutting with the graver or the "dry point," and of etching. The gravers are of various shapes and sizes, suited to the kinds of lines to be produced. Square gravers are used to cut broad lines, and lozenge-shaped gravers for the finer. The dry points and etching points resemble large sewing needles, and are fixed into handles. The graver cuts the copper out, and thus forms a clean line. The dry point used for the more delicate line raises a burr, which of course has to be scraped off.

Etching consists in first covering the surface of the copper plate with a substance known as "etching ground," and composed of a mixture of asphaltum, Burgundy pitch, and virgin wax. The subject is traced on the ground, and with the etching point marked through it, so as to expose the surface of the copper below to the action of aquafortis. This process is continued, until the fainter tints are sufficiently deep, when the acid is poured off, and the plate washed with pure water and dried. An examination is next made, and those parts of the plate which have been sufficiently acted upon by the acid, are painted over with a peculiar varnish, which prevents further "biting in" of the aquafortis. Again and again these operations are repeated, until the darkest tints are sufficiently corroded. The work has then to be finished off in its more delicate details by the use of the dry point.

A very excellent and economical plan of putting in trees, woods, rocks, and numeral figures on the copper plates is practised at Southampton. This consists in the use of steel punches, on which those objects have been engraved, and the effects thus produced are marvellous. Some of the boys, of whom there is a numerous staff at the Survey Office, are indeed exceedingly expert at this duty, and will cover a pretty large area of copper plate, with representations of forest trees of varying sizes, in a very short space of time. Like filemakers, they gain, by practice, a delicacy of touch, which makes them use the small hammer and punches with just sufficient force and no more, to effect the desired object. It is needless to say that a great saving of skilled labour, and consequently of expense, is saved by this arrangement. Much of the writing, also, on the copper plates, is engraved by Becker's Patent Machine. Sands and parks, too, are delineated by a machine fitted with a dotting wheel, the pressure of which, and the intervals between the lines of dots, regulate the depth of tint required.

In this way, then, and with some other minute manipulations, into a description of which it is not necessary now to go, the copper plates are made ready for the next operation — that of printing.

To accomplish this, the ink is dabbed on a plate with a dabber, made of old blanketing, and then wiped over with a cloth dipped in an alkaline solution. Finally it is cleaned by a cloth saturated by water only. In large surfaces like those of the plates for the 6-inch maps, this plan of cleaning is easier and more effectual than the usual mode of wiping by the hand only. The paper for printing is wetted and brushed over to make its surface smooth for the better reception of the ink, and being laid carefully on the plate, the whole is passed through the press, the upper roller of which is coated with three layers of blanketing, and one turn of a cloth called fronting, and which comes in contact with the paper. After printing, the sheets are dried between millboards. They are then put between glazed-boards, and after receiving a considerable amount of pressure in a hydraulic press, they are ready for issuing to the public.

The ink used at the Ordnance Office is composed of a mixture of Frankfort-black, and Prussian-blue. These ingredients are ground together with burnt oil, in a small mill erected on the premises.

We now arrive at one of the most important operations performed at the workshops of the Survey Office, and it is that of electrotyping, for the purpose of obtaining duplicate copies of the copper-plates. The electrotype process has been found eminently useful, not only as a means of preserving unworn copies of the plates, but also as enabling copies to be taken in their different stages of progress. Thus, for example, several classes of infor-

mation may be engraved upon a plate, which, in all other respects, would resemble the original. Distinctive maps as regards boundaries, contours, hill features, and geological lines, are thus obtainable, while all other characteristics remain identical. The value of the electrotype in ordnance mapping, can, in truth, be scarcely over-estimated; and one other especial advantage arising from it is worth mentioning. It is the facility which the process affords for altering engravings. It is much easier to scrape off obsolete details, &c., from the electrotype cast or matrix of an engraved plate, in which they are *in relief*, than to cut them out from the original copper-plate, in which they were *in intaglio*.

The galvanic battery employed at Southampton is that invented by Mr. Smee, and in which the metals used are zinc amalgamated with mercury, and copper silvered and platinised, the exciting liquid being dilute sulphuric acid. The zinc plate, 2 feet, by 2 feet 4 inches, is suspended between two platinised silvered plates of the same size as itself, in a bath of dilute sulphuric acid, one part acid to tw. nty parts water. To each of the silvered plates is attached a bundle of six copper wires, each one-tenth of an inch in diameter, and which are united by a screw-plate, from which there depends a bundle of twelve copper wires, the extremities of which are soldered to a sheet of crude copper, of the same dimensions as the plate to be copied. From the zinc plate also proceeds a bundle of twelve copper wires, which are attached to the engraved plate; this has been previously washed over with cyanide of silver and with a solution of iodine, which latter has been permitted to evaporate in the sun. By these means all chance of the adhesion of the new to the old copper is avoided. A composition of wax and tallow is also laid round the edges of the plate to prevent the deposit of electrotype copper around them.

The engraved and the plain copper sheets are then laid horizontally one above the other, with a space of about one inch between them, in a wooden trough lined with gutta percha. The trough contains a saturated solution of sulphate of copper and sulphuric acid. As soon as this is done the galvanic action commences; copper is deposited on the engraved copper plate, and the zinc plate in the battery-tank commences to be dissolved. The sheet of crude copper suffers the same fate, and as it dissolves, supplies the waste in the sulphate solution occasioned by the deposit of copper on the engraved plate. During the process a gentle rocking motion is given to the troughs by means of a simple piece of machinery put in motion by a descending weight. As soon as a sufficient time has elapsed, the plate is taken out of the trough, and the sheet of copper which has been deposited is removed from the engraved plate, of which, indeed, it will be found to be an exact cast, with this difference, as has been said, that the lines will be in relief. It is usual at Southampton to denominate the resulting plate a *matrix*; we are of opinion, however, that it would be more exact to give the plate to be copied that name.

The same process is now repeated, the newly-made plate this time forming the copy. An electrotype duplicate, and perfectly exact and beautiful *fac-simile* of the original engraved plate is the result. When we witnessed these interesting works not long since, by permission of Sir Henry James, and under the excellent guidance of Colonel Cameron, we were indeed much impressed by the perfection to which the electrotyping process had attained at the Ordnance Works.

The platinised plates, it may be mentioned, are dipped every day into a solution of perchloride of iron, to remove impurities, and the zinc plates are scrubbed at the same time.

When the battery is in good working order, and the engraved plate is laid under the sheet of rough copper, about one-third of a pound of copper to the square foot is deposited per day.

So far as the *modus operandi* of preparing Ordnance Maps, and the means of multiplying them, are concerned, we have thus endeavoured to convey accurate details to our readers. For the opportunity for gaining that information we must admit that we are indebted to a considerable extent t the gallant officers at the head of the Survey Office whose names have just been mentioned. — *From the Building News.*

ON THE PROBABLE CAUSE OF THOSE EXPLOSIONS OF STEAM BOILERS CALLED FULMINATING.

ACADEMY OF SCIENCES OF PARIS.

UNDER this title, a note was presented by M. Mangin, the substance of which is as follows:—

It results from the admirable experiments of M. Dufour, that the temperature of water may, under certain circumstances, be brought to 178° cent. (352·5° Fahr.), without the production of boiling. These circumstances are the insulation from contact with the vessel, and insulation from contact with the air. Ebullition is produced by contact with a solid, that is, by the disturbance of the molecular equilibrium, and there is then a sudden evolution of steam. Nevertheless, every solid contact is not equally efficient in producing this change of state, and it results from the experiments of M. Dufour that isolation from contact with the vessel is not absolutely necessary for the production of the phenomenon. What appears to be indispensable is that the water shall be deprived of air, that the operation shall be carried on slowly, and that the heated mass shall be withdrawn from external disturbing causes. Having explained these preliminaries, let us see how the explosions called *fulminating* are to be explained.

These explosions take place only when the machine has been for a greater or less time at rest, and generally at the moment when they are about to resume the movement of the machine; and the boiler by its complete quietness gives no indication of the event. It is enough to open the throttle-valve, or one of the gauge-cocks, or the door of the furnace or ash-pit, or, in fact, any disturbance of the unstable equilibrium which has been established, to decide the catastrophe. It has also been remarked that, before the explosion, the pressure in the boiler is rather low than high. What, then, has taken place?

When the machine was stopped, the pumps were also stopped; the furnace and ash-pit doors were closed, as were all the escapes for steam or water. The ebullition continued, the safety-valve acted, and the water which had recently been pumped in, was purged from air. Then when the activity of the fire had fallen sufficiently, the valve fell into its seat, and the apparatus assumed a state of repose. If the atmosphere was calm, the draft null, and the escapes of water and steam hermetically closed, the apparatus (allow me to use the figure) has gone to sleep, and the molecules of water being at rest, the temperature has gradually been raised to a point notably above that of evaporation under the existing pressure. As the water produces no steam, that pressure may be and may keep below that necessary for the action of the safety-valve. Things being in this condition, let any cause whatever disturb the equilibrium of the molecules, and all the heat stored up in the liquid mass is instantly employed in producing an enormous volume of steam, while the mass of water not evaporated falls to the temperature corresponding to its pressure.

Figures will easily account for the violence of the explosion which takes place. Let us suppose, in fact, that the pressure in the boiler, before the explosion, was 4 atmospheres, and that the temperature, in the quiescent state of the water, was only 170° cent. (338° Fahr.) As at 4 atmospheres the temperature of the water and steam is 145° cent. (293° Fahr.), each kilogramme of water in the boiler contains 25 units of heat above its normal quantity. Therefore, the moment this heat was liberated, it must have converted into steam $\frac{25}{606{\cdot}5 + 0{\cdot}305 \times 145 - 145}$ or nearly $\frac{1}{20}$th of a kilogramme of water; that is about one-twentieth of the mass of water in the boiler was suddenly converted into steam.

Now, if we suppose that the volume of water in the boiler was double that of the steam, a quantity of water equal to one-tenth of the volume of the steam is suddenly vaporized; and as, at a pressure of 4 atmospheres, 1 volume of water produces 477 volumes of steam, the volume of the steam will be increased 47 times, and the pressure will be 188 atmospheres. It will be conceived that against such generations of steam, the safety-valves are of no effect, and that the explosions are really fulminating.

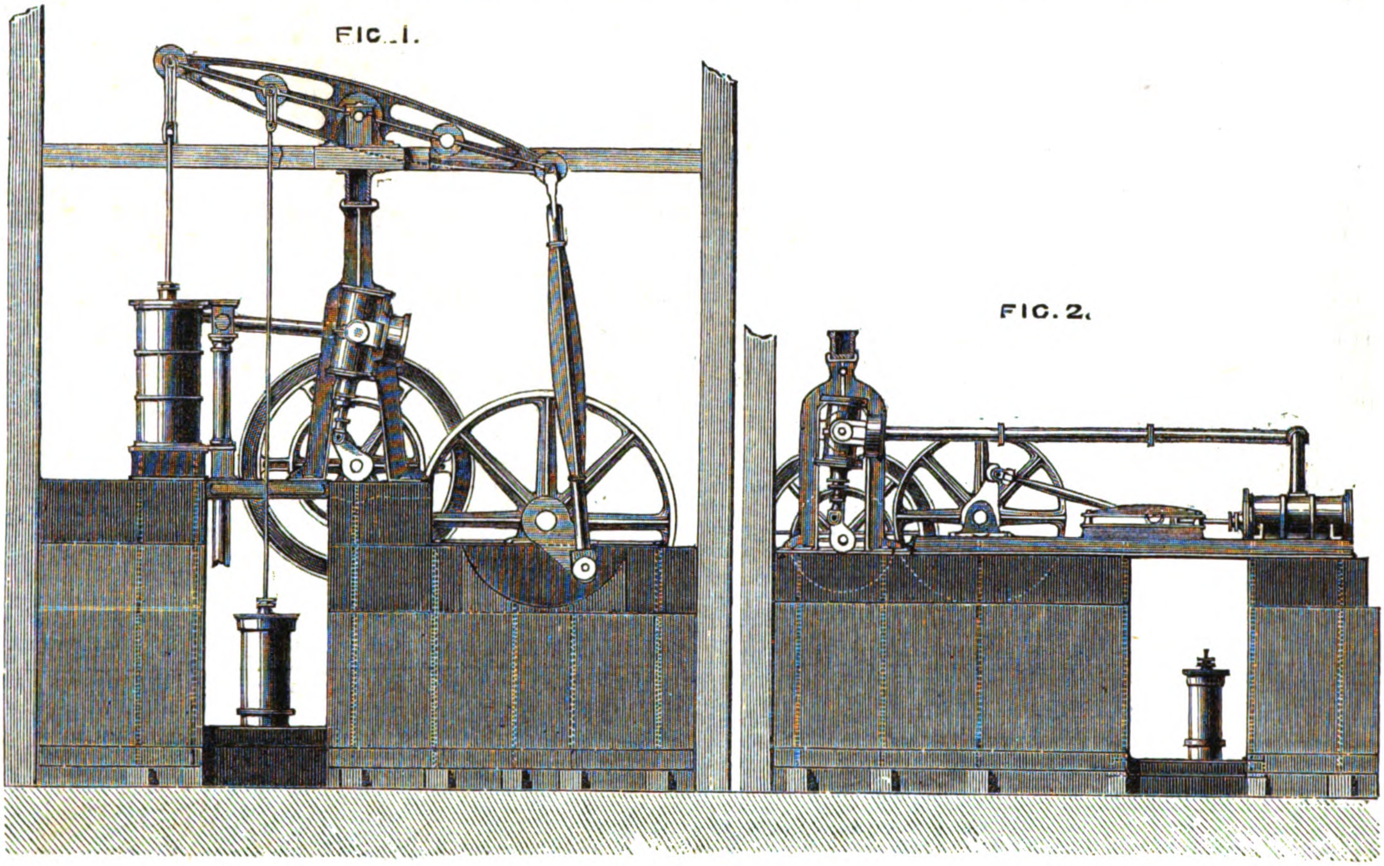
This manner of looking at the phenomenon leads to the suggestion of the following precautions. To prevent the *torpor* of the water, let the boiler be so arranged that there shall be a constant circulation kept up by the difference of temperatures of different parts. A second precaution easily taken is never to close a boiler when at rest, hermetically, but to keep the safety-valve slightly raised, or a steam-cock a little open, so that a small quantity of steam may always be forming.

AN EXPERIMENTAL STEAMER.—NEW METHOD OF PROPULSION.

ON Friday morning last, a little steamer, measuring about twelve tons, and fully fifty feet long, with only a chimney standing amidships, entered our harbour. She is the property of a military gentleman from the Clyde, and is, we understand, a patented invention, protected for a twelvemonth, showing a new method of propulsion and steering. The vessel has no rudder, but is steered — and most admirably and readily steered — by the propelling apparatus. This apparatus is fixed at the stern, and consists of a horizontal iron wheel, from which project six spokes, also horizontal, and attached to the end of each spoke, and dipping vertically into the water, is a blade, working in the same way as the blade of a patent paddle — namely, turning its "feather edge" to the water as it goes forward, but the full flat face when moving in the direction necessary for propelling the vessel. These spokes are made to revolve with the wheel with which they are connected; and this wheel, by an eccentric motion which it possesses, is made to remain fairly amidships, or is moved from port to starboard by means of a lever connected with the internal machinery. She answers to the least touch of this lever; and another remarkable property of the little craft is, that she goes as well, and steers as truly stern first as stem foremost. There is one drawback at once visible on seeing the vessel sailing; the horizontal wheel is fully a foot above the surface of the water, and the bars of the six blades being uncovered, would, in revolving, be very liable to become entangled with drift wood or other floating matter. However, a projecting cover might be made to obviate this. The vessel is chiefly occupied with the furnace and boiler and engine. Her deck is flush, and the only bulwark is a rope netting. She came from the Clyde, bound for Aberdeen. She passed through the Clyde and Forth Canal, and in a mist, early on Friday morning, went half way up the Tay without discovering her error, having lost reckoning after making the East Neuk of Fife. We are told that she has neither anchor nor compass on board. Three blades of her paddle were broken in coming through the canal, which, of course, much reduced her speed, but notwithstanding this, her gallant veteran owner, with his crew of one seaman, a stoker, and an engineer, steamed smartly out of the harbour in the afternoon, standing gaily away to the north; the little craft, not much larger than a large fishing boat, sitting lightly and steadily on the water. — *Arbroath Guide.*

A gentleman, M. Mathieu (de la Drôme), who filled no undistinguished place in the French republican assemblies of 1848, affirms that he has discovered regular tides in the atmosphere, precisely analogous to those of the sea, which reduce varieties of temperature to settled rule, by which the weather can be foretold days, weeks, nay, months, in advance, with scientific accuracy.

WOODWARD'S IMPROVED COMPOUND STEAM-ENGINE

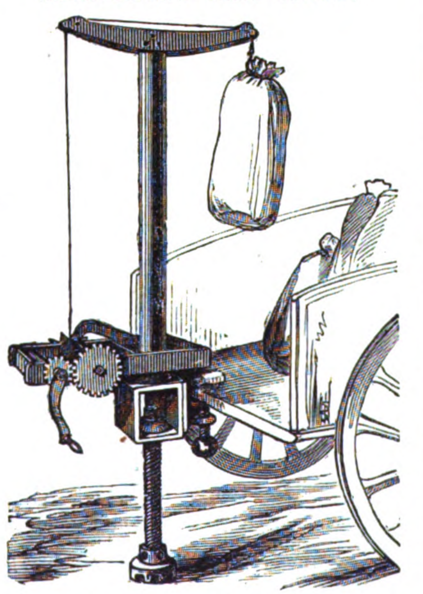


THE above engravings illustrate an invention recently patented by Messrs. Woodward, of Manchester, for improved arrangements in steam-engines. The first part consists in the arrangement and combination of a vibratory or fixed cylinder placed between the pillars of a beam engine, as represented at Fig. 1, or between the pillars and the wall of the engine-house, thereby requiring no additional foundation. The vibrating or fixed cylinder is employed as an auxiliary or pusher to the beam engine, or it may act as a separate engine. In some cases one or all of the pillars of the beam engine are taken away, and a framework of iron substituted, and so constructed as to support the vibrating or fixed cylinder; the other side may be supported by a fixing firmly secured to the wall of the engine-house. The vibrating or fixed cylinder is connected to the beam engine by means of a separate crank, crank shaft, and spur wheels, one end of the crank shaft being carried by the framework, and the other end working in a bearing fixed in the wall, through which it is carried, if required, so as to drive a mill in a separate building. The wheels are made of any desired size or proportion, and the vibrating or fixed cylinder is worked by high-pressure steam direct from the boiler, and the steam after passing through the cylinder passes to the cylinder of the beam engine, thereby forming a compact and efficient compound engine; or the vibrating or fixed cylinder may be connected direct with the condenser of the beam engine, and thus form another arrangement of compound engine.

The second part consists in the arrangement and application of a vibrating or fixed cylinder to a horizontal engine, to act as an auxiliary or pusher to the engine, as represented in Fig. 2. A framing of cast iron, placed at the end of the engine, is constructed so as to carry the vibrating or fixed cylinder, as the case may be; the cylinder is connected to the horizontal engine by means of a separate crank, crank shaft, and spur wheels, one end of the crank shaft being carried by the framework, and the other end working in a bearing secured to the wall, through which it passes if required so as to drive a separate part of the mill, or for any other purpose.

The invention consists, thirdly, in an improved arrangement and construction of the framework for carrying the vibrating or fixed cylinder, so that the power will be contained within the said framework.

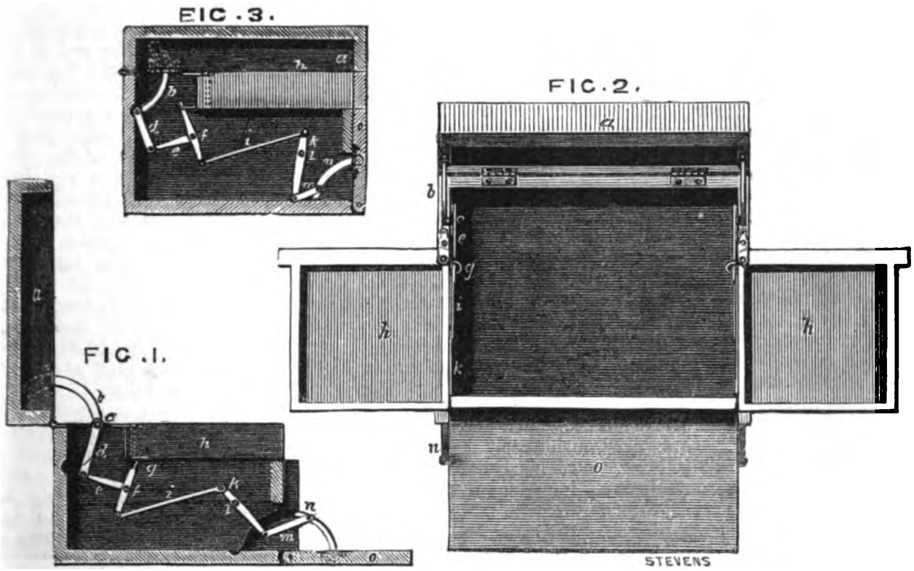
MIDDLETON'S CART CRANE.



THE accompanying engraving illustrates a very useful invention by Mr. David Middleton, of Burton by Lincoln, agriculturist, for "Improvements in cranes for lifting weights into and out of carts, and for other purposes." The engraving shows the crane in perspective as applied to the tail of a cart. The invention consists in mounting, in a convenient frame, a windlass, the shaft of which carries on one side a toothed wheel, in gear with a pinion receiving motion from a crank handle. The other end of the shaft carries a ratchet wheel, into which a paul drops to prevent the return of the drum until the paul is released from the teeth of the ratchet. An upright (by preference hollow) is supported at one end of the frame carrying a cross-bar at top, having guide-pulleys at each end thereof, and over which the rope or chain from the windlass passes. When the crane is used for raising weights from carts, the hollow upright is placed on a strong spindle connected to a foot or support, which is secured by lugs to the cart-tail; a jack screw, the lower end of which terminates in a foot, passes through the base of the support, which, while acting as a support to the cart, also enables its height from the ground to be adjusted to suit any carts or other vehicles to be loaded or unloaded.

NEW TANK LOCOMOTIVE.—The *American Railway Review* says: The tank locomotive named the Monitor, built by Danforth, Cooke & Co., for the Hudson River Railway, has some novelties worthy of especial notice. It has one pair of drivers, five feet, and two trucks; the front truck under the smoke-box, the other under the tank, behind the foot-plate. The coal-box is over the tank; it has an inclined bottom, the tank-top sloping upward to the water entrance. It holds water for about twenty miles. The fuel is Cumberland coal. The chimney is double—the inner chimney being raised or lowered by the engineman, as he wishes to vary the draft. It has two feed-water heaters, situated close behind the smoke-box, which is square-bottomed. The cylinders, judging from sight, are about 10 by 18. We shall, as soon as convenient, obtain the dimensions of all parts of this engine. We hear that its performance is entirely satisfactory, with a train of three first-class passenger-cars. Its usual train is two. It runs the Yonkers train, stopping at all stations, and keeps its time without difficulty.

BETJEMANN'S DRESSING-CASES.



MESSRS. BETJEMANN, of Pentonville, desk and dressing-case manufacturers, have obtained a patent for improvements in dressing-cases, applicable to other cases and boxes, of which the following is the specification:—

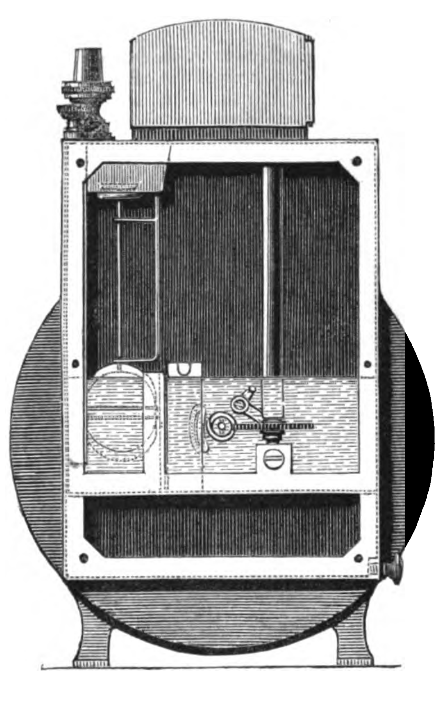
Our invention consists in an arrangement of quadrants, levers, and connecting rods, as hereafter explained, for the purpose of opening or letting down a front flap, and of opening out one side tray at one or both sides of the dressing-case upon the raising of the top or lid thereof. The action may be applied to both flap and side tray, or side trays, or to either separately.

We will suppose our invention applied to a dressing-case fitted with a front flap to let down, and with two small trays, hinged one at each side, to the upper part and sides of the dressing-case, then at each side the arrangement shown at Fig. 1 of the accompanying drawings is that which we adopt. To the lid *a* we connect a quadrant *b*, carry out an arm *c* from the lower part thereof, and by means of a bar *d* connect it to a double crank or ⊥ lever *e* centred on a stud *f* fixed in the side of the case; the upper arm of this lever enters an eye *g* projecting from a metal plate fixed to or inserted in the underside of the tray *h*, or on the side and near the back thereof. The lower arm of the double crank lever *e* is connected by another connecting rod *i* to one arm of another lever *k* centred on a stud *l* fixed in the side of the case, the opposite end of which lever is united by a link *m* to the upper end of a quadrant *n*, the lower end of which is fixed to the side of the front flap *o* near the bottom thereof. If one or both side trays only be required to be moved towards the connecting rod, the other parts of the flap are dispensed with; and, in like manner, if the flap only is to be let down, then those parts for working the side tray or trays are dispensed with.

The parts are so connected that, upon raising the lid, the flap is let down, and the side tray or trays is or are simultaneously opened out into the position shown by Fig. 2, which is a plan view of the case, while on the closing of the lid the flap is folded up, and the side tray or trays is or are also folded inwards, and the whole dressing-case thus shut, when the levers, quadrants, and other parts assume the position shown in Fig. 3.

Instead of the levers being connected to the side of the case directly, as hereinbefore mentioned, they may be attached to a metal plate or plates fixed on the sides of the case.

COCHRANE'S IMPROVED WET GAS METERS.



MR. J. COCHRANE, of Harburn, Mid-Lothian, gentleman, has just patented an invention for improvements in wet gas meters, which relates to their peculiar arrangement, whereby the ordinary existing meters, as well as meters constructed according to this invention, are made to comply with the requirements of the Sale of Gas Act. According to this invention, as illustrated above, it is proposed to surround the present float of the gas inlet valve by a box or partition so as to separate it from the ordinary water chamber of the meter, and to insert the lower end of the water supply pipe into this box or float chamber, in lieu of into the main water chamber as heretofore. By this means the smallest quantity of water which may be fraudulently extracted by a syphon or otherwise through the water supply pipe, will instantly affect the position of the float, and cause the gas to be shut off without affecting, in the slightest degree, the proper water level in the measuring chamber.

ON FORCE.

(*Concluded from page 15.*)

THERE is one other consideration connected with the permanence of our present terrestrial conditions, which is well worthy of our attention. Standing upon one of the London bridges, we observe the current of the Thames reversed, and the water poured upward twice a day. The water thus moved rubs against the river's bed and sides, and heat is the consequence of this friction. The heat thus generated is in part radiated into space, and then lost, as far as the earth is concerned. What is it that supplies this incessant loss? The earth's rotation. Let us look a little more closely at the matter. Imagine the moon fixed, and the earth turning like a wheel from west to east in its diurnal rotation. Suppose a high mountain on the earth's surface; on approaching the moon's meridian, that mountain is, as it were, laid hold of by the moon, and forms a kind of handle by which the earth is pulled more quickly round. But when the meridian is passed, the pull of the moon on the mountain would be in the opposite direction—it now tends to diminish the velocity of rotation as much as it previously augmented it; and thus the action of all fixed bodies on the earth's surface is neutralised. But suppose the mountain to lie always to the east of the moon's meridian, the pull then would be always exerted against the earth's rotation, the velocity of which would be diminished in a degree corresponding to the strength of the pull. *The tidal wave occupies this position*—it lies always to the east of the moon's meridian, and thus the waters of the ocean are in part dragged as a brake along the surface of the earth; and as a brake they must diminish the velocity of the earth's rotation. The diminution, though inevitable, is, however, too small to make itself felt within the period over which observations on the subject extend. Supposing then that we turn a mill by the action of the tide, and produce heat by the friction of the mill-stones; that heat has an origin totally different from the heat produced by another mill which is turned by a mountain stream. The former is produced at the expense of the earth's rotation, the latter at the expense of the sun's radiation.

The sun, by the act of vaporisation, lifts mechanically all the moisture of our air. It condenses and falls in the form of rain—it freezes and falls as snow. In this solid form it is piled upon the Alpine heights, and furnishes materials for the glaciers of the Alps. But the sun again interposes, liberates the solidified liquid, and permits it to roll by gravity to the sea. The mechanical force of every river in the world, as it rolls towards the ocean, is drawn from the heat of the sun. No streamlet glides to a lower level without having been first lifted to the elevation from which it springs by the mighty power of the sun. The energy of winds is also due entirely to the sun; but there is still another work which he performs, and his connection with which is not so obvious. Trees and vegetables grow upon the earth, and when burned they give rise to heat, and hence to mechanical energy. Whence is this power derived? You see this oxide of iron, produced by the falling together of the atoms of iron and oxygen; here also is a transparent gas which you cannot now see—carbonic acid gas—which is formed by the falling together of carbon and oxygen. These atoms thus in close union resemble our lead weight while resting on the earth; but I can wind up the weight and prepare it for another fall, and so these atoms can be wound up, separated from each other, and thus enabled to repeat the process of combination. In the building of plants carbonic acid is the material from which the carbon of the plant is derived; and the solar beam is the agent which tears the atoms asunder, setting the oxygen free, and allowing the carbon to aggregate in woody fibre. Let the solar rays fall upon a surface of sand; the sand is heated, and finally radiates away as much heat as it receives; let the same beams fall upon a forest, the quantity of heat given back is less than the forest receives, for the energy of a portion of the sunbeams is invested in building up the trees in the manner indicated.

Without the sun the reduction of the carbonic acid cannot be effected, and an amount of sunlight is consumed exactly equivalent to the molecular work done. Thus trees are formed; thus the cotton on which Mr. Bazley discoursed last Friday is formed. I ignite this cotton, and it flames; the oxygen again unites with its beloved carbon; but an amount of heat equal to that which you see produced by its combustion was sacrificed by the sun to form that bit of cotton.

But we cannot stop at vegetable life, for this is the source, mediate or immediate, of all animal life. The sun severs the carbon from its oxygen; the animal consumes the vegetable thus formed, and in its arteries a reunion of the severed elements takes place, and produces animal heat. Thus, strictly speaking, the process of building a vegetable is one of winding up; the process of building an animal is one of running down. The warmth of our bodies, and every mechanical energy which we exert, trace their lineage directly to the sun. The fight of a pair of pugilists, the motion of an army, or the lifting of his own body up mountain slopes by an Alpine climber, are all cases of mechanical energy drawn from the sun. Not, therefore, in a poetical, but in a purely mechanical sense, are we children of the sun. Without food we should soon oxidise our own bodies. A man weighing 150 lbs. has 64 lbs. of muscle; but these, when dried, reduce themselves to 15 lbs. Doing an ordinary day's work for 80 days, this mass of muscle would be wholly oxidised. Special organs which do more work would be more quickly oxidised: the heart, for example, if entirely unsustained, would be oxidised in about a week. Take the amount of heat due to the direct oxidation of a given amount of food; a less amount of heat is developed by this food in the working animal frame, and the missing quantity is the exact equivalent of the mechanical work which the body accomplishes.

I might extend these considerations — the work, indeed, is done to my hand—but I am warned that I have kept you already too long. To whom then are we indebted for the striking generalisations of this evening's discourse? All that I have laid before you is the work of a man of whom you have scarcely ever heard. All that I have brought before you has been taken from the labours of a German physician, named Mayer. Without external stimulus, and pursuing his profession as town physician in Heilbronn, this man was the first to raise the conception of the interaction of natural forces to clearness in his own mind. And yet he is scarcely ever heard of in scientific lectures, and even to scientific men his merits are but partially known. Led by his own beautiful researches, and quite independent of Mayer, Mr. Joule published his first paper on the "Mechanical Value of Heat" in 1843; but in 1842 Mayer had actually calculated the mechanical equivalent of heat from data which a man of rare originality alone could turn to account. From the velocity of sound in air Mayer determined the mechanical equivalent of heat. In 1845 he published his Memoir on "Organic Motion," and applied the mechanical theory of heat in the most fearless and precise manner to vital processes. He also embraced the other natural agents in his chain of conservation. In 1853 Mr. Waterston proposed, independently, the meteoric theory of the sun's heat, and in 1854 Professor William Thomson applied his admirable mathematical powers to the development of the theory; but six years previously the subject had been handled in a masterly manner by Mayer, and all that I have said on this subject has been derived from him. When we consider the circumstances of Mayer's life, and the period at which he wrote, we cannot fail to be struck with astonishment at what he has accomplished. Here was a man of genius working in silence, animated solely by a love of his subject, and arriving at the most important results some time in advance of those whose lives were entirely devoted to Natural Philosophy. It was the accident of bleeding a feverish patient at Java in 1840 that led Mayer to speculate on these subjects. He noticed that the venous blood in the tropics was of a much brighter red than in colder latitudes, and his reasoning on this fact led him into the laboratory of natural forces, where he has worked with such signal ability and success. Well, you will desire to know what has become of this man. His mind gave way; he became insane, and he was sent to a lunatic asylum. In a biographical dictionary of his country it is stated that he died there: but this is incorrect. He recovered; and, I believe, is at this moment a cultivator of vineyards in Heilbronn.

June 20.

While preparing for publication my last course of lectures on Heat, I wished to make myself acquainted with all that Mayer had done in connection with this subject. I accordingly wrote to two gentlemen who above all others seemed likely to give me the information which I needed. Both of them are Germans, and both particularly distinguished in connection with the Dynamical Theory of Heat. Each of them kindly furnished me with the list of Mayer's publications, and one of them was so friendly as to order them from a bookseller, and to send them to me. This friend, in his reply to my first letter regarding Mayer, stated his belief that I should not find anything very important in Mayer's writings; but before forwarding the memoirs to me he read them himself. His letter accompanying the first of these papers contains the following words:—"I must here retract the statement in my last letter, that you would not find much matter of importance in Mayer's writings: I am astonished at the multitude of beautiful and correct thoughts which they contain;" and he goes on to point out various important subjects, in the treatment of which Mayer had anticipated other eminent writers. My second friend, in whose own publications the name of Mayer repeatedly occurs, and whose papers containing these references were translated some years ago by myself, was, on the 10th of last month, unacquainted with the thoughtful and beautiful essay of Mayer's, entitled "Beiträge zur Dynamik des Himmels;" and in 1854, when Professor William Thomson developed in so striking a manner the meteoric theory of the sun's heat, he was certainly not aware of the existence of that essay, though from a recent article in "Macmillan's Magazine" I infer that he is now aware of it. Mayer's physiological writings have been referred to by physiologists — by Dr. Carpenter, for example — in terms of honourable recognition. We have hitherto, indeed, obtained fragmentary glimpses of the man, partly from physicists and partly from physiologists; but his total merit has never yet been recognised as it assuredly would have been had he chosen a happier mode of publication. I do not think a greater disservice could be done to a man of science than to overstate his claims: such overstatement is sure to recoil to the disadvantage of him in whose interest it is made. But when Mayer's opportunities, achievements, and fate are taken into account, I do not think that I shall be deeply blamed for attempting to place him in that honourable position which I believe to be his due.

Here, however, are the titles of Mayer's papers, the perusal of which will correct any error of judgment into which I may have fallen regarding their author. "Bemerkungen über die Kräfte der unbelebten Natur," Liebig's Annalen, 1842, vol. xlii. p. 231; "Die Organische Bewegung in ihrem Zusammenhange mit dem Stoff-wechsel;" Heilbronn, 1845; "Beiträge zur Dynamik des Himmels," Heilbronn, 1848; "Bemerkungen über das Mechanische Equivalent der Wärme," Heilbronn, 1851. J. T.

DRAINAGE OF THE MIDDLE LEVEL.

THE *Exchange* says: — The principles on which Telford and Rennie drained the Levels (1826-29) may be briefly stated. There are three essentials to good drainage: — A channel large enough to receive the water; a declivity sufficient to carry it off; and an outfall to the sea or some other body of water large enough to receive it. The channel was provided by widening the rivers and drains where necessary; the declivity, by cutting a straight channel to supersede the old meandering course of the Nene. This last work was rendered imperative by the flatness of the Level. It was demonstrated that water will not flow with the requisite rapidity if its inclination towards the sea is less than four inches per mile in a straight line; and of course every curve in a stream diminishes the force of the current, and renders a greater declivity necessary to prevent the accumulation of water in the channel. The course of the Nene was straightened in accordance with this reasoning; a favourable spot was selected for the discharge of the waters; and the result was that the lower water line was lowered 10 feet 6 inches; 1,500 acres were embanked and brought into cultivation; the value of the land was greatly augmented, and the navigation at Wisbeach wonderfully improved. The works in the North Level were even more successful, for 75,000 acres, of which 15,000 had previously been absolutely worthless, were raised to a value of 50*l.* to 70*l.* an acre, by the effects of the catchwater and navigable drains provided by the new scheme. Since this period nearly half a million of money has been spent in further improvements, in harmony with the plans of Telford and Rennie. In 1834, by making a new cut, removing an old sluice, and by some other works, the advantage of correct principles in draining was demonstrated in a remarkable manner. The works were finished on Saturday night, and on Sunday morning the water accumulated in far distant drains began to move. At Thorney, near Peterborough, fifteen miles from the sea, the people were at church when the cry was heard, "The waters are running!" when immediately "the whole flocked out, parson and all, to see this great sight, and to acknowledge the blessings of science."

ROAD-MAKING.

A FRENCH inventor has recently built, or at least designed, a steam roller to consolidate gravel and macadamised roads. A pair of cylinders, inclined at forty-five degrees, act on an outside crank on one end of the axle of the main roller or drum. The front axle has wheels as broad as can be, and is controlled by steering-gear similar to that used on steam-carriages and traction-engines. It is said that this machine will be better than horse-drawn rollers, because it can run both backwards and forwards with equal facility, be easily reversed and work on a short piece of road until it is sufficiently consolidated; and it does not impair its own work by digging it up, as horses' feet do. Without saying that this particular engine is the best that can be devised for this work, we confidently say that these claims are far within the limits of what is already demonstrated by engines built for other uses. We have ridden upon an engine that had a drum in place of a pair of driving-wheels, and have carefully observed its effects on a gravel road, and were convinced that such engines would make gravel roads as hard as the foot-path alongside of them—even much harder, because of their immense weight. But while horses beat up the roads, such material as gravel will be loose, unless rolled by great numbers of heavy rollers or broad wheels. Macadam, before a parliamentary committee, said that in dry weather the fast horses would make the roads too loose for quick travelling, were it not for the effect of the wheels in rolling down what the feet knocked up.

As the collection and distribution of all traffic must be by common roads, it is important to railways and all other main conveyances that common roads should be aided by the science that has thus far tended to deprive them of the attention necessary to keep them in economical condition. If more talent and money had been spent upon them less horseflesh, carriage-wear, and less time would have been lost upon them, and the result would have been a great saving of public wealth. Good rollers, especially if moved by a power that will not allow horses to disturb the surface until it is well hardened and levelled, may do much to mitigate the barbarism of common roads.

THE ORDNANCE ENQUIRY.

(From the *Liverpool Albion.*)

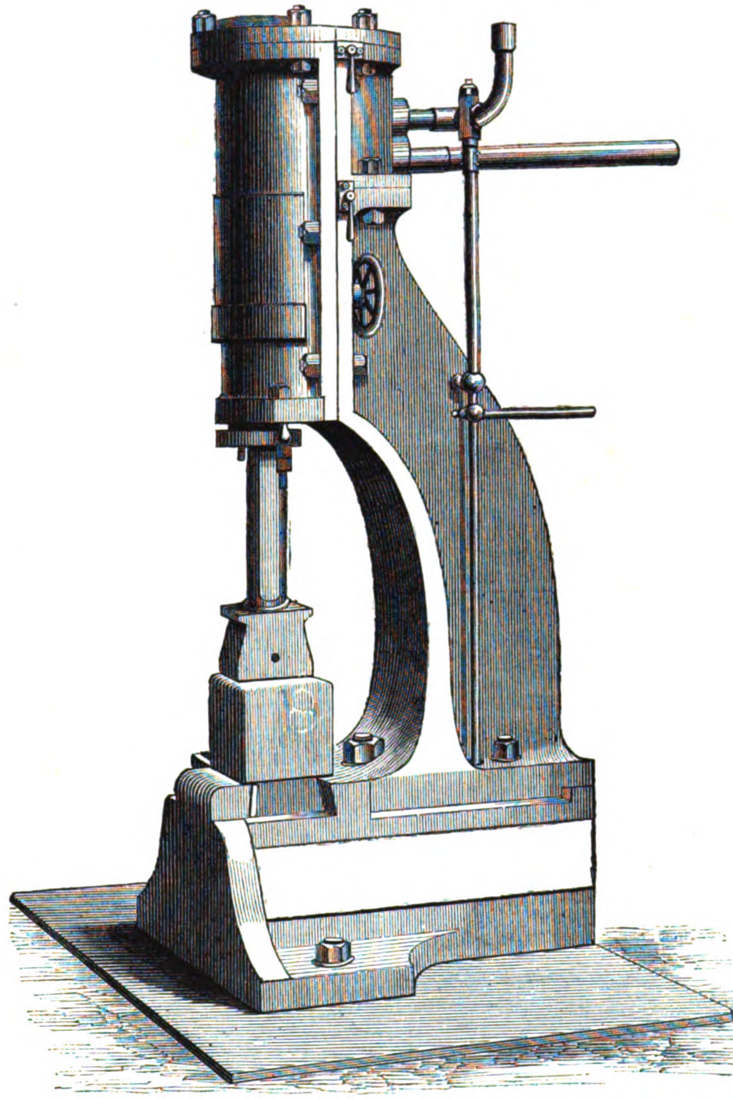
THE further the ordnance enquiry proceeds, and it has as yet scarcely advanced beyond the threshold, the more strongly the need of such an investigation, in the interest of the public, becomes apparent. The evidence given at the outset by Colonel Lefroy with respect to the circumstances under which the manufacture of Armstrong guns was conducted — the advance of 40,000*l.* by Government to the Elswick Company, the anomalous position of Sir William Armstrong, and the payment of prices averaging fifty per cent. above what the same articles can be produced for at Woolwich—was not a little startling to the public, and seems to have surprised those of the committee who are not participants in the secrets of the War Office. Major-General Tulloh has since given evidence which has brought to light many additional facts not at all calculated to mitigate the impressions produced by the evidence taken at the first sitting. It was important to ascertain what proportion of the guns made since the agreement was entered into with the Elswick Company have been constructed there, and what proportion at Woolwich, and also whether there was any actual want of means at Woolwich to produce the required supply of guns, without having recourse to private establishments at all, which would give a colourable excuse for the payment of prices to the Elswick Company, averaging 50 per cent., and amounting in some instances to more than 100 per cent., above the prices at which the same articles could be produced at Woolwich. Major-General Tulloh has been examined on this point, and his evidence makes the aspect of the transactions between the Government and Sir William Armstrong more suspicious than before. The Royal Gun Factory has never failed, he informed the committee, to supply all the guns that have been required, even during the war with Russia; and though many changes have been made from time to time in the construction of the Armstrong gun, which have interposed delays, the same thing took place in the case of the Lancaster gun, which, nevertheless, was produced at Woolwich to the extent required, without any very severe pressure upon the resources of the establishment. Why it should have required supplementing with the Elswick factory is, therefore, inexplicable by any of the considerations which would influence private individuals in dealing with their own affairs. Having the means of producing all the guns and projectiles which could possibly be required at Woolwich, why have the Government employed the Elswick Company so largely, and at prices so enormously above the cost of the same articles at their own factory? We learn, for instance, that orders have lately been given for twenty-four large smooth-bore guns, and that all but four of these are to be manufactured at Elswick. The reason assigned is, that the Elswick Company have a much larger steam-hammer than the largest at Woolwich; but why this has been allowed to be so, and why the means should have been given to the Elswick Company of setting up plant which should give them an advantage over the Government, we are not told. We learn, however, that the agreement between the Government and the Company obliges the former to profitably employ the plant set up by an advance of public money; and that in default the Company may demand compensation. We trust that this matter will be thoroughly sifted.

INTERNATIONAL EXHIBITION.

CLASS VIII., No. 1813.

THE illustration annexed represents one of Joy's patent steam hammers manufactured and exhibited by Messrs. Garrett, Marshall, and Co., of the Sun Foundry, Leeds. The principal advantage to be obtained from this hammer is its extreme simplicity, having no valve motion, levers, or stuffing box, nor any continuously moving part, except the "piston slide valve" and "hammer."

JOY'S PATENT STEAM HAMMER



The valve motion usually applied in self-acting hammers is more or less complicated, and gets out of adjustment and repair; this is here entirely superseded by allowing the steam which actuates the hammer to perform the office of valve motion, being admitted above and below the "piston slide valve" in the requisite quantity, and for a suitable period of time, to give any required stroke or quality of impulse to the hammer, without the disadvantage of too much "lead." This steam hammer is also double-acting, thereby giving the most powerful blow in the shortest space of time. The force of such blow can be regulated at pleasure with the greatest nicety, and the length of stroke can also be varied to whatever is requisite by merely adjusting the hand wheel shown above. In these hammers an increased bearance is given to the piston rod, &c., by the depth of the piston being more than its own diameter. For steel tilting and other work, when some 400 to 500 blows per minute are necessary, this hammer has its parts even further reduced to that of the piston rod and hammer head, only with additional length of cylinder and guidance.

A limited company, with a capital of 100,000*l.*, in shares of 50*l.* each, entitled the Hafod-y-Wern Slate Company, has been formed for further extending the quarry on the great Bangor slate range. Slates are at present being produced, and with the works which it is now proposed to carry out it is expected that the quarry will prove highly remunerative.

PRESERVATION OF MEATS.

AT a recent meeting of the Society for the Encouragement of National Industry, M. Peligot read the following note of M. Martin de Lignac on his new patented process for the preservation of meats:—

"In the usual way of salting, the meat is placed first in salt, and afterwards in the pickle. The salt absorbs the liquids in proportion as they separate from the flesh, then the pickle penetrates by endosmose, and preserves them from any subsequent alteration by its antiseptic properties. But in this case, the salt acts on the surface a long time before it penetrates to the centre, whence results an excess of salt at the surface, whilst the centre is not sufficiently salted, and still contains the principles of fermentation. To avoid this, the habit is to cut up the meat; but this, while it increases the chances of its preservation, greatly alters its quality. In fact, the salt in contact with large surfaces absorbs too largely the liquids contained in the flesh, and extracts from them the aroma and a portion of their nutritive juices. Pork, the tissue of which is dense and protected by fat, bears this preparation better than beef, the flesh of which, after long standing in the salt, presents only a fibrous tissue without flavour, and with but a low nutritive power.

"It results from these facts; first, that meat preserved by the usual process contains necessarily too much salt, and that its prolonged use is injurious to health; secondly, that it loses a part — sometimes a notable part—of its nutritive value.

"The method of avoiding these inconveniences is to salt uniformly and not subdivide too far the meat, thus preserving its aroma and its juices; I think that I have found the solution of this problem, and the following are the means which I employ:

"If it is a ham which I wish to salt, I introduce, by means of a trocar, between the bone and the muscle at the small end, a sound which I attach to a stop-cock which communicates by a tube with a reservoir of water saturated with salt, to which are added various aromatics and condiments. The reservoir is from 25 to 35 feet high. When the stop-cock is opened, the liquid by its pressure rapidly separates the muscle, and the two or three ounces of pickle which are necessary for the preparation of one pound of meat, are easily lodged in the cellular tissue which surrounds the bone. Thence it forms a kind of reservoir, the liquid spreads, penetrating all the fibres by infiltration, distributing regularly and homogeneously the conservative agent, and producing its first effect upon the part most susceptible of alteration, that which surrounds the bone. The hams thus prepared are put for some days in a pickle-bath. The object of this bath is to prevent by its pressure the issue of the liquid injected; besides which it completes the preparation by saturating the surface. When they leave the bath, the meat has lost nothing of the weight which it had at its entrance. I then expose them to a current of air at a moderate temperature. When by evaporation they have lost the infiltrated liquid and 5 per cent. of their normal weight, I expose them to the action of smoke for a time which varies with their weight. This latter operation is not necessary for their preservation, but it gives them a taste which is generally sought for, and effects a reduction of weight. On leaving the smoke-house they have lost from 12 to 15 per cent. of their weight; before entering they had already lost about 5 per cent., so that their whole loss is from 18 to 20 per cent." — *Cosmos.*

TO CORRESPONDENTS.

J. F. C., M. and Co, W. A., J. R., R. R., J. B., T. G, Capt. N., G. C., J. N., S. and Co., D. and J., J. T., R. H., W. D., H. R. R.

Correspondence.

[We do not hold ourselves responsible for the statements of our Correspondents.]

THE STRAIGHT LINE *VERSUS* THE WAVE LINE FOR VESSELS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Sir,—I cannot in courtesy decline replying to Mr. Moy; but I do hope we shall not drift into a trifling unprofitable manner of discussing the wave line theory, which we certainly shall if, instead of accepting the invitation I gave him, to defend that theory on its merits, or to dispute my refutation of it, he merely urges idle objections to my straight line system of moulding the bows of vessels. I allude to what he says of the evil of uniform motion, through "the inseparable jerks" which arise from sudden changes in matter "*from* a state of rest and *to* a state of rest." This is all quite correct in reference to the case by which he illustrates it—namely, the uniform motion that could be given, and which at one time many foolish inventors (under the teaching of equally foolish mathematicians, that the crank involved a loss of power) were bent on giving, to the piston of the steam-engine—because here the action is intermittent; but no shocks, no "jerks," can arise where both the action and the resistance are continuous and equably constant, as in the cleaving and eversion of water by the bows of vessels, whatever may be the suddenness and velocity with which it may be put into motion. This is so obvious, that I need not say another word, except incidentally to remark, that the gradual subsiding of the water into a state of rest, so far as the action of the bows is concerned, is common to both hollow and straight lines, if equally rounded off into the lines of the side of the vessel.

Mr. Moy treats the subject with his usual good sense when he refers to the results of experiments in proof of the superiority of the wave line. Now, unfortunately, experiments are as capable of leading us into the wrong path as mathematical theories; they equally require comprehensive thought, and also reasoning power apart from the trammels of narrow rigorous and literal deduction, to assign to them their proper interpretation in the one case, and their proper application in the other. Philosophers did not prove the existence of a principle of levity by pointing to the ascent of wood in water; neither did mathematicians convince practically-minded men of the power-losing character of the crank by a demonstration of the relative magnitudes and directions of components and resultants in the parallelograms of momenta and of pressures. And as to the case in hand, that portion of the resistance opposed to the progress of a vessel which is due to friction is relatively so large when the motion is slow, and the difficulties in other respects in the way of conducting experiments properly, especially with the needful velocities, are so great, that we may be easily led astray, and the more so if prepossessions occupy the mind. However, I, too, can refer to experiments, made by Mr. Bland with small models, and with low velocities, which seem to show, so far as they can be depended upon under such conditions, and others equally faulty, that the wave line is inferior to the straight line, and that a line slightly convex is superior to both. But reason tells me that the last conclusion cannot be correct, for where are we to arrive at the minimum of resistance in that direction? And this dictate of reason is confirmed by subsequent experiments, proving that a greater convexity is an evil. The fact is, the straight line was not rounded off into the side line, and the angle formed must have been injurious. Other causes connected with the comparative smoothness of the models might exist. They should have been varnished, and polished like glass.

But I can refer to practice, which is better still, in support of my side of the question. The ship Bremen, built by Messrs. Caird & Co., of Greenock, was reported on by the Committee of the British Association (of which I presume Mr. Atherton was reporter) as being a crack ship for doing work in proportion to engine power. Calculating by the formula $\frac{v^3 \times \text{Mid. Sec.}}{\text{I H P}}$ I make her coefficient to be 862. Now, the very highest number, as published, of the performances of Her Majesty's vessels is 724, the average being about 500. Well, this ship has slightly convex lines, of which some become hollow only upon a near approach to the stem, in order to avoid an angle, which is practically the same thing as straight lines rounded and hollowed at their extremities for the same purpose.

Mr. Moy is desirous of knowing "what angle of bow I prefer," and requests me to give "definite answers to definite questions;" but then his question should not be indefinite. He should define it with its circumstances and conditions. Lines for a frigate and for a yacht will not be equally appropriate. I am to *presume* that he alludes to the angle of the load-water section, although the angle of other horizontal sections are of equal, if not of greater, importance. So, being without definite particulars, I am unable to give him a definite answer. But, assuming that the load-water section is meant, that it is a case in which the finest bow consistent with advantage is desirable, and that it will be combined with yet finer lines below, I do not at present think the angle should be less than 10 degrees with the longitudinal axis; unless, indeed, the vessel should be of an enormous size, carrying ample breadth for stability, such as the Great Eastern, and in her, I believe, the angle is less than this. But the question would, or should, be very much influenced by the angles of other lines. All of which, as befalls all practical subjects, unless you have the particular case before you, is very indefinite, and very distressing to all mathematical and logical minds, adherents of the deductive order of reasoning, pure and exact.

Yours, &c.,

Benj. Cheverton.

July 14.

Shot-proof Ships.—It appears from a return to Parliament that the number of proposals and plans for the purpose of shot-proof ships submitted to the Admiralty between May 1, 1859, and May 1, 1862, amounts to 590. The whole were, in the first instance, referred to the Comptroller of the Navy and the assistant officers of his department for consideration and report; 85 were subsequently referred to the committee on iron plates; 19 to Captain Hewlett, commanding the gunnery ship at Portsmouth; and 1 to a special committee. On the 12th ult. there were 37 plans and proposals under consideration.

Gossip.

In the House of Commons, on Tuesday night, Mr. Laird asked the Secretary of State for War if he had decided when to try the Horsfall gun, and whether he had any objection that the trials be made at Shoeburyness upon the same target that was subjected to the Armstrong 300 pounder gun on Monday, the 7th inst., and also upon any other targets now making for experimental purposes.—Sir G. C. Lewis stated that arrangements had been made for the removal of the gun from Southsea to Shoeburyness, and for the trial of experiments with it against a target formed on the model of the sides of the Warrior.

The large dredger has come upon the wreck of a vessel in Shields Harbour, and the diver in the employ of the Tyne Commissioners is employed in lifting it by means of the weigh keel. This vessel is supposed to have lain in the bottom of the river since September 8, 1740. On that day the Prince Frederick, of Guernsey, was driven from her anchors in a great storm of wind, and ran foul of several vessels, some of which shared the same fate with her. The Prince Frederick, by the impetuosity of the wind on her larboard side, heeled gunwale in, and the starboard midship port being open to take in coals, the water filled her so quickly that she sank immediately. A Custom-house officer named Harbottle, two men, and a boy perished, two of them in the cabin. Several anchors of a much more ancient date have been fished up during the recent dredging operations in the Tyne; and some old armour, as if soldiers had been drowned while crossing the stormy waters of the Tyne, have also been brought to light.

On Saturday last a dinner of an unusually interesting character took place at Willis's Rooms, on the occasion of the anniversary of the Acclimatisation Society. The objects for which the society has been formed are the introduction, acclimatisation, and domestication of animals, birds, fishes, insects, and vegetables, whether useful or ornamental; the perfection, propagation, and hybridisation of races already domesticated; the spread of indigenous and naturalised animals, &c., from parts of the United Kingdom where they are already known to other localities where they are not known; the procuration, whether by purchase, gift, or exchange, of animals, &c., from British colonies and foreign countries; the transmission of animals from England to her colonies and foreign parts, in exchange for others sent from thence to the society; and the holding of periodical meetings, and the publication of reports and transactions for the purpose of spreading knowledge of acclimatisation, and of enquiry into the causes of failure. Lord Stanley occupied the chair.

Conversazione at the Royal Polytechnic.—The directors of the Polytechnic had a conversazione at the rooms of their Institution in Regent Street, on Wednesday evening, which was attended by a numerous assembly of ladies and gentlemen, comprising men eminent in science, patrons and friends of that popular Institution. If the affair was an experiment—and they are good at experiments there—the directors must have been as pleased at their success as their guests were gratified by the entertainment. There were a series of brilliant experiments with electricity, supplied by four powerful batteries, which were not only marvellous to the ordinary on-looker, but must have been surprising even to those who are well acquainted with the properties of that most subtle agent. Professor Wheatstone, who was present, must have been delighted by the result of investigations with which his labours have been so long connected. The hall was illuminated by four electric lights, one of which, in a cut-glass lantern, made for the occasion by Messrs. Defries, displayed every colour of prismatic ray with astonishing effect. The telegraph was busy transmitting messages to Paris, Vienna, and St. Petersburgh; Liverpool, Glasgow, and Dublin; to all of which answers were returned. Captain Bolton was present with his lime light, passing signals to Highgate Church, and Mr. Ward exhibited and explained the purposes of his ocean telegraph. There were also displayed many rare and curious articles from India; works of art in silver electro-plate and gold, from Messrs. Hunt and Roskell's; a variety of processes in manufacture, and scientific instruments of every variety. The evening was enlivened by music, vocal and instrumental, and when we add that abundance of refreshments was provided, it will be evident that the friends of the Polytechnic enjoyed a pleasant evening at that long honoured and successful school of the Arts and Sciences.

INTERNATIONAL EXHIBITION.

DISTRIBUTION OF AWARDS.

The ceremony of the distribution of the awards by the Commissioners of the International Exhibition took place on the 11th inst. The following is a list of the awards for mechanical contrivances, &c.:—

CLASS I.

MINING, QUARRYING, METALLURGY, AND MINERAL PRODUCTS.

JURORS.—Sir Roderick Murchison, F.R.S., F.G.S. chairman. Igino Cocchi, Italy; Chas. Combes, France; J. A. C. das Neves Cabral, Portugal; Lieut.-Gen. Alex. Gerngross, Russia; Sir W. Logan, Canada; Francisco Luxan, Spain; Sir Roderick Murchison, F.R.S., F.G.S., chairman, London; C. Overweg (Dr. Wedding, proxy), Zollverein; J. Percy, M.D., F.R.S., F.G.S., London; Warrington W. Smyth, M.A., F.R.S., F.G.S., secretary, London; Thomas Sopwith, F.R.S., F.G.S., Newcastle; K. Styffe, Sweden; Peter Tunner, Austria; A. de Vaux, deputy-chairman, Belgium; H. Hussey Vivian, M.P., F.G.S., Swansea; Nicholas Wood, F.G.S., Newcastle. Associates: Draubrée, France; Dubocq, France; J. Oakes, Alfreton.

MEDAL.—UNITED KINGDOM.—Aberdare Iron Co; Barker, Rawson, and Co; Bell Brothers; Bickford, Smith, and Co.; Birley, S.; Blaenavon Iron and Coal Co.; Bolckow and Vaughan; Bowling Iron Co.; Brown and Jeffcock; Brown, J., and Co.; Butterly and Co.; Cheesewring Granite Co.; Coal Owners of Northumberland and Durham; Courage, A., and Co.; Crawshay, H., and Co.; Daglish, J.; Dowlais Iron Co.; Eastwood and Sons; Ebbw Vale and Pontypool Co.; Evans and Askin; Farnley Iron Co.; Forster, G. B.; Freeman, W. and J; Geological Survey of the United Kingdom; Governor and Co. of Copper Miners; Gowans, J.; Granville, Earl; Greaves, J. W.; Greenwell, G. C.; Henderson, J.; Hewlett, A.; Higgs, S., and Sons; Hird, Dawson, and Hardy; Holland, S., and Co.; Holmes, J.; Howard, Hon. J.; Howard, Ravenhill, and Co.; Johnson, Matthey, and Co.; Kirkstall Forge Co.; Lilleshall Iron Co.; Lizard Serpentine Co.; Llangollen Slab and Slate Co.; Londonderry, Marchioness of; Lowry, J. W.; Macdonald, A.; Margam Tinplate Co.; Meik, T.; Mersey Steel Iron Co.; Michell, R.; Mona Mine Co.; Monk Bridge Iron Co.; More, Rev. T. F.; Museum of Practical Geology; Mylne, R.; Newcastle, Duke of; Parkside Mining Co.; Patent Plumbago Crucible Co.; Pearce, W., jun.; Pease, J. and J. H.; Price, Dr D. S.; Quilliam, T.; Rhiwbryfdir Slate Co.; Robinson, W., and Co.; Rogers, Ebr.; Salt—Chamber of Commerce; Schneider and Hannay; Scottish Ironmasters; Shelton Bar Iron Co.; Sim, W.; Smith, R., for Earl Dudley; Sunderland Local Committee; Swansea Local Committee; Taylor Brothers, and Co; Thompson, Hatton, and Co; Turner, Cassons, and Co.; Vint, G., and Brothers; Vigra and Clogau Copper Mining Co.; Weardale Iron Co.; Welsh Slate Co.; Wimshurst's Patent Metal Foil Co.; Wood and Daglish; Woodhouse and Jeffcock; Wombwell Main Coal Co.; Wright, S.; Ystalyfera Iron Co.

CANADA.—Billings, E., of the Geological Survey; English and Canadian Mining Co.; Foley and Co.; Hunt, J. Sterry, of Geological Survey; Larue and Co.; Montreal Mining Co.; Taylor, A.; the Officers of the Geological Survey of Canada; Walton, B.; West Canada Mining Co.; Williams, for Canadian Oil Co.

COLUMBIA.—Executive Committee.

INDIA.—Dr. Hunter; East India Iron Co.; Local Committee, Calcutta; Montgomery, Martin; Oldham, Professor; Rajah of Vizianagarum; Surveyor-General of India.

JAMAICA.—Lucas Barrett.

NATAL.—Sutherland, Dr.

NEW BRUNSWICK.—Commissioners of New Brunswick.

NEWFOUNDLAND.—Newfoundland Government.

NEW SOUTH WALES.—Australian Agricultural Co.; Dawson, A.; Keene, W.; Low, J. C.; M'Lean (Surveyor-General); Royal Mint.

NEW ZEALAND.—Bank of New Zealand; Heaphy, C.

NELSON.—Nelson Government.

OTAGO.—Holmes, M.

NOVA SCOTIA.—Honeyman, Rev.; Howe, Prof.; Provincial Government; Scott, J.

SOUTH AUSTRALIA.—Burra Burra Mining Co.; Kapunda Mining Co.; Wallaroo Mining Co.; Wheal Ellen Mining Co.

TASMANIA.—Calder, J. E.; Commissioners of Tasmania; Gould, C.; Milligan, J.

TRINIDAD.—Wall, G. P.

VICTORIA.—Bank of Australasia; Bank of New South Wales; Black Hill Mining Co.; Burkitt, A. H.; Clark and Sons; Clunes Mining Co; Colonial Bank of Australasia; Commissioners of Victoria Exhibition; Daintree, R.; Davidson, R.; Knight, J. G.; M'Coy, Prof. Fred.; Rowe, G.; Smyth, Brough; Selwyn, A.; Turner, W. J.; Victoria Government; Victoria Kaolin Co.

CLASS V.

RAILWAY PLANT, INCLUDING LOCOMOTIVE ENGINES AND CARRIAGES.

JURORS.—Duke of Sutherland, Chairman; W. Baker, C.E., London; G. P. Bidder, C. E. London; T. R. Crampton, London; Flachat, Deputy Chairman, France; James Kitson, Leeds; Krüger, Zollverein; J. E. Mc Connell, Wolverton; F. Spitaels, Belgium; Arch. Sturrock, Doncaster; Col. Jolland, R. E., F.R.S., Secretary, London.

MEDAL.—UNITED KINGDOM.—Ashbury, J.; Bateson, S. S.; Beattie, J.; Beyer, Peacock, and Co.; Brown, G. and J., and Co.; Fay, C.; Gibson, J.; Kitchin, R.; Manning, Wardle, and Co.; Mansell; Napier, Vickers, and Co.; Newell, J.; Pooley, H. and Son; Sharp, Stewart, and Co.; Wright, J., and Sons.

CANADA.—Larue and Co.

CLASS VI.

CARRIAGES NOT CONNECTED WITH RAIL OR TRAM ROADS.

JURORS.—General Morin, Director of the Conservatory of Arts and Manufactures, France, Chairman; Jos. Holland, London; H. Holmes, Derby; Geo. N. Hooper, Secretary, London; J. W. Peters, London; Viscount Torrington, Deputy Chairman, London. Associate: H. Tresca, France.

MEDAL.—UNITED KINGDOM.—Aldebert, J. Booker, and Sons; Braby, J., and Son; Briggs, G., and Co.; Cockshoot, J.; Cole, W.; Cook and Holdway; Edwards, Son, and Chamberlayne; Hall and Sons; Hazeldine, G.; Holroyd, Noble, and Collier; Hutton, J., and Sons; M'Naught and Smith; Mason, H. H.; Rigby and Robinson; Rock and Son; Shanks, R. H. and F.; Silk and Sons; Thrupp and Maberly; Turril, H. L.; Ward, J.; Woodall and Son; Wyburn and Co.

CLASS VII.

MANUFACTURING MACHINES AND TOOLS.

JURORS.—W. Fairbairn, F R.S, chairman.

SECTION A.—Boettcher, Zollverein; J. Callon (M. Luuyt, proxy), France; J. Cheetham, Staleybridge; M. Curtis, Manchester; Ben. Fothergill, London; J. Kindt, President of Section, Belgium; J. G. Marshall, Leeds.

SECTION B.—J. Anderson, Woolwich; Major Contl, Secretary, Italy; W. Fairbairn, F.R.S., Chairman and President of Section, Manchester; Robert Mallet, F.R.S., London; Rev. H. Moseley, M.A., F.R.S., Bristol; Dr. Rühlmann, Deputy Chairman, Zollverein; Baron Séguier, France; J. Whitworth, F.R.S., Manchester. Associates: Charles Buxton, M.P., London; William Gossage, Warrington; E. Pontifex, London.

SECTION A.—MACHINERY EMPLOYED IN SPINNING AND WEAVING, &C.

MEDAL.—UNITED KINGDOM.—Anderston Foundry Co.; Apperly, J. and Co.; Combe, J. and Co.; Dickenson, W. and Sons; Dobson and Barlow; Ferrabee, J. and Co.; Hattersley, G. and Son; Hetherington and Sons; Higgins, W. and Sons; Hodgson, G.; Mason, J.; Parker, C. and Sons; Platt, Brothers; Rowan, J. and Sons; Sharp, Stewart, and Co.; Smith, W. and Brothers; Tuer and Hall; Walker and Hacking; Wren and Hopkinson.

SECTION B.—MACHINES AND TOOLS EMPLOYED IN THE MANUFACTURE OF WOOD AND METAL.

MEDAL.—UNITED KINGDOM.—Barnett, S.; Bertram, G.; Beyer, Peacock, and Co.; Bradley and Craven; Clayton, H. and Co; De Bergue, C. and Co.; Donkin, B.; Fairbairn, P. and Co.; Forrester, G. and Co.; Garside, H.; Greenwood and Batley; Handyside, A. and Co.; Holtzapffel, L. and Co.; Hulse, J. S.; Johnson and Atkinson; Lockett, J., Sons, and Leake; Manlove, Alliott, and Co.; Mathieson, A. and Son; McOnie, W. and A; Mirrlees and Tait; Mitchell, W. H.; Morgan and Co.; Morrison, R. and Co.; Muir and Co.; Napier, D. and Sons; Normandy and Co.; Powis, J. and Co.; Robinson, T. and Son; Samuelson, M. and Co.; Siebe, D.; Siemens, Halske, and Co.; Sharp, Stewart, and Co.; Shepherd, Hill, and Co.; Smith, J. and Son; Smith, Beacock, and Tannett; Vicars, T. and T. and Co.; Waterlow and Sons; Naysmith and Co.; Worssam and Co.; Whitehead; Yates, W. S.; Youngman, C. T.

CLASS VIII.

MACHINERY IN GENERAL.

JURORS.—Michael Chevalier, Chairman—L. R. Bodmer, Switzerland; Chevalier de Burg, Austria; Earl of Caithness, London; J. Hawkshaw, F.R.S., F.G.S., London; J. Hick, C.E., Deputy Chairman, Bolton; J. M. da Ponte Horta, Portugal; C. Jenny, Austria; W. M. Neilson, C.E., Glasgow; John Penn, C.E., London; O. Pihl, Norway; Du Pré, Belgium; W. Macquorn Rankine, Secretary, Glasgow; F. B. Taylor, United States; H. Thomas, Zollverein. Associates: Carl Jenny, Austria; Paul Luuyt, France.

SPECIAL JURY OF CLASS VIII.—J. F. Bateman, F.R.S., London; Captain Bent, London; W. M. Brown, London; Earl of Caithness, London; J. Hawkshaw, London; C. Jenny, Austria; P. Luuyt, France; J. E. M'Connell, Wolverton; O. Pihl, Norway; W. M. Rankin, Glasgow; Captain Shaw, London; Duke of Sutherland, London; F. B. Taylor, United States; H. Thomas, Zollverein; H. Tresca, France.

MEDAL.—UNITED KINGDOM.—Allen, Harrison, and Co; Armstrong, Sir W. G. and Co; Ashton, J. P; Bastier, J. U.; Bowser and Cameron; Bray's Traction Engine Company; Broughton Copper Company; Carrett, Marshall, and Co; Chaplin and Co; Chedgey, J.; Clark, D. K., Clarke, E; Clayton, Shuttleworth and Co.; Eadie and Spencer; Easton, Amos, and Sons; Edwards, C. J. and Son; Fawcett, Preston, and Co.; Forrest and Barr; Fowke, Captain F., R.E.; Frieake and Gathercole; Greenwood, Batley and Co.; Gwynne and Co.; Harrison, J.; Harvey and Co.; Humphreys and Tennant; Imperial Iron Tube Company; Laird, J. Sons and Co.; Lambert, T. and Sons; Lilleshall Company; Lloyd, G.; Manchester Water Meter Company; Maudslay, Sons, and Field; McOnie, W. and A.; Merryweather and Son; Mirrlees and Tait; Middleton, T.; Morrison, R. and Co.; Napier, D. and Son; Napier, R. and Sons; Newton, Keates, and Co.; Normandy and Co.; North British Rubber Company; North Moor Foundry Company; Peel, Williams, and Peel; Preller, C. A.; Ransomes and Sims; Rennie, G. and Sons; Roberts, W.; Robinson, W.; Routledge and Ommanney; Russell, J. and Sons; Salter, G. and Co; Samuelson, M. and Co.; Shand and Mason; Siemens, C. W.; Stephenson Tube Company; Taylor, J. and Co.; Thomson, James; Thornewill and Warham; Tod and M'Gregor; Tuxford and Son; Webb and Son; Wenham, F. H.; Weston, T. A.; Whitmore and Sons; Wilson, J. C. and Co.; Williamson, Brothers.

VICTORIA.—Commissioners of Victorian Exhibition; Harper.

CLASS IX.

AGRICULTURAL AND HORTICULTURAL MACHINES AND IMPLEMENTS.

JURORS.—Marquis de Perales, President of the Cattle Club, Spain, Chairman.—C.E. Amos, C.E., London; Colonel Challoner, London; C. J. Dannfelt, Sweden; G. Devincenzi, Italy; E. Egan, Austria; Viscount Eversley, F.G.S., London; J. Gibson, Dalkeith; Professor B. S. Jorgensen, Denmark; Wellington Lee, United States; Lord Talbot de Malahide, F.R.G.S., Deputy Chairman, Dublin; Hervé Mangon, Joint Secretary, France; L. De Mathelin, Belgium; J. Miller, Falkirk; J. C. Morton, Joint Secretary, London; Sir Joseph Paxton, M.P., F.L.S., London; J. Pintus, Zollverein; Sir John Villiers Shelley, Bart., M.P., London. Associate: E. Moll, France.

MEDAL.—UNITED KINGDOM.—Aveling, J.; Bamlett, A. and Co.; Barrett, Exall, and Andrews; Bell, Rev. P.; Bentall, E. H.; Boby, R.; Bray's Traction Engine Company; Burgess and Key; Childs and Owen; Clayton, Shuttleworth, and Co.; Coleman and Sons; Cornes, J.; Croskill, W. (trustees of); Fowler, J. jun.; Garrett and Son; Green, T.; Hancock, J. and F. and Co.; Howard, J. and F.; Hereman, S.; Holmes and Sons; Hornsby and Sons; Hughes and Sons; Hunter, P.; Kemp, Murray, and Nicholson; Kennan and Sons; Musgrave, Bros.; Ormson, H.; Priest and Woolnough; Ransomes and Sims; Richmond and Chandler; Robey and Co.; Ruston, Proctor, and Co.; Sellar, G. and Sons; Shanks and Sons; Smith, W.; Smyth, J. and Sons; Snowdon, W.; Taylor, J. and Sons; Turner, E. R. and F.; Tuxford and Sons; Underhill, W. S.; Wallis and Haslam; Weeks, J. and Co.; Whitehead, J.; Whitmee, J. and Co.; Young, T. and T.

CANADA.—Gaskin, Captain P.; Jeffry, J.; M'Sherry, J.; Morley, J.; Paterson J.; Whiting and Co.

NEW BRUNSWICK.—New Brunswick Commissioners.

SOUTH AUSTRALIA.—Mellor, J.

VICTORIA.—Robinson and Co.

CLASS XI.

MILITARY ENGINEERING, ARMOUR AND ACCOUTREMENTS, ORDNANCE AND SMALL ARMS.

SECTIONS A AND B.—CLOTHING AND ACCOUTREMENTS, TENTS, CAMP EQUIPAGE, AND MILITARY ENGINEERING.

JURORS.—Sir J. Burgoyne, Bart., chairman.

SECTION A.—Major-General Sir Fred. Abbott, C.B., Secretary, London; Col. Jos. Hudson, London; E. Moisez, France; Viscount Ranelagh, London; Major Russell, Egypt; General Paolo Solaroli, Deputy Chairman, Italy.

SECTION B.—Baron Treuille de Beaulieu, France; General Sir J. Burgoyne, Bart., G.C.B., Chairman and President of Section, London; Captain Douglas Galton, R.E., F.R.S., London; Major-General Hon. Jas. Lindsay, M.P., London; Colonel Henry Owen, R.E., C.B., Plymouth.

SECTION C.—Sir W. Armstrong, F.R.S., C.B., London; Lieut.-General Giovanni Cavilli, Italy; General Guiod, France; General the Hon. A. Gordon, C.B., F.R.G.S., London; Major-General Hay, London; Colonel Messoud Bey, Turkey; L. Micheels, Belgium; Nich. Novitzky, Russia; Westley Richards, Birmingham; Colonel St. George, C.B., R.A., Woolwich; Lord Vernon, President of the Section, London; Weyersberg, Zollverein, Associate; Major Porter, R.E., London.

MEDAL.—UNITED KINGDOM.—Adair, Colonel; Department of the Inspector-General of Fortifications and the Royal Engineer Establishment at Chatham; Ducane, Captain E. F.; Fowke, Captain R. E.; James, Colonel Sir H.; Jones, Serjeant-Major; Lovell, J. W.; Royal Medical Department of the War Office; Topographical Department of the War Office; Turner, G.

SECTION C.—ARMS AND ORDNANCE.

MEDAL.—UNITED KINGDOM.—Adams, R.; Baker, F. T.; Birmingham Military Arms Trade; Blakely, Captain; Bland, Captain; Brazier, J.; Chevalier; Daw, G. H.; Dougall, J. D.; Ebrall, S.; Elswick Ordnance Company; Fox, Lieut.-Colonel A. Lane; Gibbs, G.; Gladstone, H. and Co.; Gisborne, F. N.; Grainger, J.; Lancaster, C. W.; Lang, J.; London Armoury Company; Manton, John and Sons; Mont-Storm, Wm.; Royal Carriage Department, Woolwich; Royal Gun Factories, Woolwich; Royal Laboratory, Woolwich; Royal Small Arms Factory, Enfield; Sharpe, B.; Whitworth Rifle and Ordnance Company; Wilkinson and Son.

CLASS XII.

NAVAL ARCHITECTURE, INCLUDING SHIPS' TACKLES.

JURORS.—Robert Napier, shipbuilder, Glasgow, chairman.

SECTION A.—Rear-Admiral Fitzroy, F.R.S., London; Rear-Admiral P. Lisiansky, Russia; Paris, Deputy Chairman, France; J. D'A. Samuda, London; Isaac Watts, C.B., London. Associates: R. Abethell, London; Captain Belavenetz, Russia.

SECTION B.—Right Hon. Milner Gibson, M.P., London; Sir W. Snow Harris, F.R.S., Plymouth; Mangin, France; Rear-Admiral Washington, F.R.S., President of Section, London.

SECTION C.—Clapeyron, France; H. D. Cunningham, F.R.G.S., Portsmouth: W. S. Lindsay, M.P., London; Rear-Admiral R. S. Robinson, London. Associate: Evans, R.N., London.

SECTION A.—SHIPS FOR PURPOSES OF WAR OR COMMERCE.

MEDAL.—UNITED KINGDOM.—Admiralty Modeller; Coles, Cowper, Captain, R.N.; Denny Brothers, W; Gray, J. W. and Son; Griffiths, R.; Hornsey, W.; J. Jones, jun, Kirkaldy; Laird, J. Son and Co.; Lords of the Admiralty; Mare, Messrs. J. C. and Co.; Rennie, G. and Son; Russell, J. S.; Thames Iron Works and Ship Building Co.; Thompson, N.

SECTIONS B AND C.—LIFE BOATS, BARGES, AND VESSELS FOR AMUSEMENT, AND SHIP'S TACKLE AND RIGGING.

MEDAL.—UNITED KINGDOM.—Brown, Lenox and Co.; Clifford, C.; Dent and Co; Halkett, P. A.; Herbert, G.; Lords of the Admiralty; Lords Commissioners of the Admiralty; Martin, C.; Parkes, H. P.; Peacock, G.; Royal National Life Boat Institution; Searle, E.; Sinibaldi, Madame; Trotman, J.; Ward, Captain T., R.N.; West, J. G. and Co.; Wood, Brothers, and Co.

NEW SOUTH WALES.—Reynolds, A.

NEW ZEALAND.—Lloyd, Neil.

NOVA SCOTIA.—Mesher, J.

TASMANIA.—Commissioners for Tasmania.

CLASS XV.

HOROLOGICAL INSTRUMENTS.

JURORS.—Viscount de Villa Maior, Portugal, Chairman: Dr. Frick, Zollverein; Ch. Frodsham, Secretary, London; Rt. Haswell, London; E. D. Johnson, London; Laugier, Deputy Chairman, France; Sylvain Mairet, Switzerland; Rear-Admiral Manners, F.R.A.S., London; Lord Wrottesley, F.R.S. London.

MEDAL.—UNITED KINGDOM.—Adams and Son; Barraud and Lund; Bennett, J.; Blackie, G.; Brooks, S. A.; Cole, J. F.; Condliff, J.; Cooke, T. and Sons; Delolme, H.; Dent and Co.; Dent, M. F. and Co.; Ganeval and Callard; Guib et and Rambal; Guillaume, E. and C.; Hewett, S. and J. Prescott Committee; Hutton, J.; Jackson, W. H. and S.; Klaftenberger, C. J.; Kullberg, V.; Losada, J. R.; M'Lennan; Molyneux, W., Prescott Committee; Moore, B. and J.; Nicole and Capt; Parkinson and Frodsham; Pendleton, P., Prescot Committee; Poole, J.; Rotherham and Sons; Saggerson, E., Prescott Committee; Sewill, J.; Smith and Sons; Walker, J.; Walsh, A. P.; Webster, R.; White, E.; Wycherley, J., Prescott Committee.

CLASS XXXI.

Hardware.

Jurors.—Dr. Von Steinbeis, Stuttgart, Chairman.

Section A.—J. G. Appold, F.R.S., London; W. Bird, London; Giulio Curioni, Italy; Daubrée, France; Chev. de Fridau, Austria; A. Grill, Sweden; H. E. Hoole, President of Section, Sheffield; J. Oakes, Alfreton; D. S. Price, Ph. D., F.C.S, Secretary, London; L. Ravené, jun., Zollverein; G. Shaw, Birmingham; L. Trasenter, Belgium. Associates: M. J. Harpley, London; C. Lan, France; A. Upward, London.

Section B.—S. Buckley, Birmingham; E. Gem, Birmingham; P. C. Hardwick, President of Section, London; V. Paillard, France; Ferdinand Stamm, Ph. D., Secretary, Austria; Dr. Von Steinbeis. Chairman, Zollverein; A. Tylor, Deputy Chairman, London.

Section C.—Robert Fletcher, Birmingham; Goldenberg, France; W. A. Rose, London; G. Stobwasser, President of Section, Zollverein; J. S. Wyon, Secretary, London.

Section A.—Manufactures in Iron.

MEDAL.—United Kingdom.—Avery, W. and T.; Baily, W. and Son; Barnard, Bishop, and Barnards; Barton, J.; Benham and Sons; Bennett, T.; Bennett W.; Billinge, J.; Binks, Brothers; Bolton, T. and Sons; Bradford, T.; Bramah and Co.; Brown and Green; Brown, Lenox, and Co.; Buist, G.; Bullock, T. and Son; Butler, J. and Sons; Carron Iron Company; Chubb and Son; Clark, T., C., and Co.; Coalbrookdale and Co.; Cornforth, J.; Cottam and Co.; Cotterill, E.; Day and Millward; Deane, E.; Dollar, T. A.; Duley and Sons; Edelsten and Williams; Edwards, F. and Son; Evans, J. and Co.; Feetham. M. and Co.; Field, W. and Son; Finlay, J.; Firman and Sons; Flavel, S. and Co.; General Iron Foundry Company; Glass, Elliott, and Co.; Greening, N. and Sons; Griffiths and Browett; Hammond, Turner, and Sons; Handyside, A. and Co.; Hargreaves, W.; Hawkins, J. and Co.; Heaton, R. and Sons; Hewens, R.; Hiatt and Co.; Hobbs, Ashley, and Co.; Hopkins, J. H. and Sons; Iles, C.; James and Sons; Jeakes, C. and Co.; Jenkins, Hill, and Jenkins; Jones and Rowe; Keith, G.; Kennard, R. W. and Co.; Kenrick, A. and Sons; Kent, G.; Knight, Merry, and Co.; Leoni, S.; Linley, T. and Sons; Mander, Weaver, and Co.; Martineau, F. E. and Co.; Maxwell, H. and Co.; Nettlefold and Chamberlain; Onions, J. C.; Patent Enamel Co.; Peyton and Peyton; Pierce, W.; Potter, T.; Price, C. and Co.; Price, G.; Radclyffe, T.; Reynolds, J.; Rollason, A. and Sons; Scott, J. W.; Siebe, D.; Exhibitor, Harrison, Smith, F. and Co.; Stickley, C.; Stuart and Smith; Summerscales, W. and Son; Tann, J.; Titford, R. V. and Co; Tucker and Reeves; Tylor and Pace; Warden, J. and Sons; Watkins and Keene; Watkin, W. and Co.; Webster and Horsfall; Wenham Lake Ice Company; Whitfield, T. and Co.; Williamson, W.; Wilkins and Weatherly; Winfield, R. W. and Son; Wright, P.; Yates, Heywood, and Drabble.

Victoria.—Hughes and Harvey.

Section B.—Manufactures in Brass and Copper.

MEDAL, United Kingdom.—Benhams and Froud; Bischoff, Brown, and Co.; Croll, Rait, and Co.; Duckham, H. A. F.; Glover, G., and Co.; Glover, T.; Guest and Chrimes; Hardman, J. and Co.; Hart and Son; Hinckes, J., and Son; Lambart, T., and Son; Leale, A.; Messenger and Sons; Newton, Keats, and Co., Philip, C. J.; Prosser, W., and H. J. Standly; Skidmore, Art-Manufacturers' Co.; Strode, W.; Sugg, W.; Thomason, J., and Co.; Tonks, W. and Sons; Warfield; Warner and Sons.

Section C.—Manufactures in Tin, Lead, Zinc, Pewter, and General Braziery.

MEDAL.—United Kingdom.—Chatterton, J.; Dixon, J., and Sons; Gilbert, J. A., and Co.; Loveridge, H., and Co.; Wilson, R. and W.

CLASS XXXII.

Steel.

Jurors.—Lord Wharncliffe, Chairman.

Section A.—J. Brown, President of Section, Sheffield; Fremy, Deputy Chairman, France; Robert Jackson, Secretary, Sheffield; Thomas Jessop, Sheffield; Dr. Karmarsch, Zollverein.

Section B.—Henry Atkin, London; De Hennezel, France; M. Hunter, jun., Secretary, Sheffield; William Matthews, Sheffield; Basil Roshkof, Russia; Baron Sobrero, Italy; F. Wertheim, President of Section, Austria.

Section A.—Steel Manufactures.

MEDAL.—United Kingdom.—Bessemer, H.; Boulton and Son; Cammell, and Co.; Gillott, J.; Goodman, G.; Hinks, Wells, and Co: Kirby, Beard, and Co.; Knights and Co.; Milward and Sons; Mitchell, W. (Birmingham); Mogg, and Co.; Myers and Son; Naylor, Vickers, and Co.; Page, W. and J.; Perry, J., and Co.; Shortridge, Howell, and Co.; Smith and Houghton; Thomas and Sons; Townsend and Co.; Turner, M., and Co.; Turton Brothers.

Section B.—Cutlery and Edge Tools.

MEDAL.—United Kingdom.—Addis, J. B.; Allarton and Powell; Baker, W.; Brookes and Crookes; Eadon and Sons; Eastwood, G; Fuller, J. H.; Gibbins and Sons; Gilpin, W., sen. and Co.; Greenslade, E. A. and W.; Hannah, A.; Hardy, T.; Hawcroft and Sons; Howarth, J.; Jowitt and Son; Linneker, R. and J.; Mappin, Brothers; Mappin and Co.; Marsh, Brothers and Co; Mechi and Basin; Parkin, J.; Peace, Ward, and Co.; Rodgers and Sons; Saynor and Cooke; Steer and Webster; Taylor, H.; Unwin and Rogers; Waldrow and Sons; Wilkinson, W. and Son; Wilkinson, T. and Son; Wostenholm and Son.

Canada.—Gaskin, Capt. R.; Tongue and Co.

Note.—In the preceding List of Awards it frequently happens that the same exhibitor has been voted awards by more than one jury. These duplicate awards have been allowed to remain on the record; but according to the decision of Her Majesty's Commissioners, and of the Council of Chairmen, only one medal will be given to an exhibitor, unless the objects rewarded are exhibited in distinct classes.

LYON PLAYFAIR,
Special Commissioner for Juries.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

The Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

Steam Engines, 16.
Boilers and Furnaces, *None.*
Roads and Vehicles, 3261, 1, 10, 12.
Ships and Boats, 3263, 9.
Cultivation of the Soil, 3265, 15.
Food and Beverages, 3257, 13.
Fibrous Fabrics, 3258, 3260, 3276, 7, 20.
Buildings and Building Materials, 11.
Lighting, Heating, and Ventilating, 3259, 3264, 3267, 6, 14, 17.
Furniture and Apparel, 3262, 3266, 3269, 3274, 2, 8.
Chemistry and Photography, *None.*
Warfare, 5.
Miscellaneous, 3268, 3270, 3271, 3272, 3273, 3275, 3, 4.

3257. W. E. Newton. *Improvements in the manufacture of cube sugar.* (A communication.) Dated Dec. 30, 1861.

This consists, 1, in exposing the grains or crystals to the action of steam, by which the surfaces are subjected to the necessary degrees of heat and moisture, to give them the requisite degree of adhesiveness to form the cubes. 2. In the formation of the cubes by means of machinery composed principally of an endless or continuous series of moulds fitted with compressing and discharging pistons, and having applied in combination with them a cam or cams or their equivalents for operating the pistons one or more at a time in regular succession throughout the whole series, so that if the moulders are regularly supplied with granular sugar, a continuous delivery of compactly-compressed cubes will be effected. *Patent completed.*

3258. J. B. Payne. *Improved machinery for the manufacture of laid and other twine, lines, ropes, bands, and other cordage, whether made of hemp, flax, or other fibrous substances, or of wire.* Dated Dec. 30, 1861.

This invention is not described apart from the drawings. *Patent completed.*

3259. A. I. Austen. *Improvements in the manufacture of night lights.* Dated Dec. 30, 1861.

This invention consists in producing transparency in the case, and a polish on the outside of the ordinary thick box or "round" used in the manufacture of night-lights, by saturating the box with a candle or night-light material of a higher melting point than the fatty material which the box surrounds. The method most suitable in producing this transparency and polish is to steep the box in a preparation of stearine and wax, which, when withdrawn, is allowed to drain in a hot closet; the boxes are then placed on a mandril, and while revolving in a lathe or otherwise a polish is produced by the friction of a flannel or other suitable pad. *Patent abandoned.*

3260. W. Tongue. *Improvements in the manufacture of certain descriptions of woven looped and bobbin net fabrics, by the application of certain fibrous materials thereto* Dated Dec. 31, 1861.

The first and second parts of this invention consist in the application to the manufacture of woven, looped, and bobbin net fabrics of fibres obtained from certain plants growing in Assam and other parts of Eastern Asia, and in all parts of the East Indian peninsula. The second part of the invention consists in crossing the warp thread in the manner known as cross weaving, when manufacturing woven fabrics known as "gauzes," in the manner and from the materials described in the second part of the invention. *Patent completed.*

3261. A. Macnair. *Improvements in axle boxes for railway carriages.* (A communication.) Dated Dec. 31, 1861.

Here the journal of the axle is formed and shaped in the ordinary manner, but instead of the usual bearing made of brass or other metal, a strong hoop of iron, steel, or other suitable metal is made; this hoop is turned or bored in the inside, so that the journal exactly fits into the shape in which the hoop is bored. This hoop is four or five times in its inside diameter greater than the external diameter of the journal; or it may be of other proportions. The hoop is carried by and connected to the inside of the axle box by a metal wheel of suitable size, also turned on its outside to the same shape and length as the shape and length of the journal, and this metal wheel revolves freely on a pin of steel, or other metal of suitable strength, securely fixed in the axle box. The axle box slides freely in the horn-plates, by the grooves formed on it outside. The journal is kept steady in the axle box by guides formed on the inside end of the box, which act as guides to the axle. *Patent abandoned.*

3262. W. Lougue. *Improvements in the manufacture of umbrellas and parasols.* Dated Dec. 31, 1861.

This consists in weaving the fabrics for covering umbrellas and parasols from "China grass" and "Rhea fibre," also from the fibre known as the "mudar" or "yercum fibre." *Patent completed.*

3263. T. and W. Green, and R. Mathers. *Improvements in chains for giving motion to chain-wheels, and in giving motion to machinery.* Dated Dec. 31, 1861.

This consists, 1, in constructing chains used for giving motion to chain-wheels with extra links, or what may be termed guard links on each side of the driving-links; these extra links are to overlap the edges of the teeth of the chain wheels, and they serve to keep the chain in its place on the wheels. When using these chains, flanges are not required in the chain wheels. 2. In giving motion to machinery by the combined use of a chain and chain wheels, and friction surfaces, such as a pulley and band or friction wheels, which wheels may be plain grooved. *Patent completed.*

3264. N. McHaffie. *Improvements in ventilators or valves for regulating the passage of air or other fluids, whether of a gaseous or liquid form.* Dated Dec. 31, 1861.

Here, when applying a ventilator or valve for admission of external air, the patentee causes the current of air to impinge on a surface so arranged that, when the current of air exceeds the velocity considered desirable, the surface may be able to yield to it, and on yielding may close or partially close the valve. When the force of the current diminishes, the valve again opens, it being so weighted as always to tend to do so. For the passage of liquids, this last-mentioned surface should be mounted on a horizontal axis, but instead of being at or near its lower extremity, it should be at or near its upper extremity, on account of the greater density of the fluid, the passage of which is sought to be regulated. *Patent completed.*

3265. T. Pickford. *Improvements in the manufacture of manure.* Dated Dec. 31, 1861.

In preparing manure according to this invention, the inventor azotizes, ammoniates, and manipulates Sombrero Island phosphate guano according to a new process, in order to produce valuable manure equal in all and superior in some qualities to the Peruvian guano. He effects this object by mixing in pans, tanks, or chests (or chests either lined with lead or not), the Sombrero Island phosphate guano and other animal or bone phosphates in certain proportions, small sea shells ground to a fine powder (cockle shells preferred). He then adds to about one ton of the above mixture about one cwt. of Peruvian guano, saturated with urine, diluted sulphuric acid, and muriate of sodium in a mixer, and adds certain proportions of magnesian limestone (say about 100 lbs.) powdered and mixed with bones or gas sulphates of ammonia. *Patent abandoned.*

3266. F. Tolhausen. *A new method and machinery for covering springs used for petticoats and other articles.* (A communication.) Dated Dec. 31, 1861.

This consists in coiling the thread round the spring at a greater or less angle of inclination; further, in dressing the said thread before or after coiling with the proper agglutinative, or gelatinous matter, such as gelatine or size, or dressing the spring previous to being coiled, so as to cause the coils to stick together and form one solid body like a woven fabric; and, lastly, in passing the springs or ribs so coiled through a set of embossed rollers, by which the cohesion of the coil is further improved upon, and the proper gloss and fabric-like appearance is given. *Patent abandoned.*

3267. W. Spence. *Improvements in deflectors for lamps.* (A communication.) Dated Dec. 31, 1861.

The object here is the prevention of the partial obscuration of light from the lamp, caused by surrounding the flame with a deflector composed of an opaque material, and consists in the substitution of a deflector composed of glass or other transparent material for that which is ordinarily composed of metal. The deflector is in form similar to those in ordinary use as applied to lamps in which kerosene and other heavy oils are burned, such form being that of a hollow cone with a hole at the top of the form required to suit the form of the wick. *Patent completed.*

3268. J. Haslem. *Improved apparatus for winding, holding, and letting go cords, bands, or chains.* Dated Dec. 31, 1861.

The first part of this invention refers to the formation of blind-rollers where the ordinary endless cord is used, and consists, first, in making the roller and pulley of one solid piece of wood; secondly, in making the pulley if separate of gutta percha, India-rubber, leather, baffalo hide, or horn; thirdly, in a substitute for the rack and pulley used to distend the endless cord. The second part of the invention refers to that class of blind furniture wherein a single cord is employed coiled on a barrel at one end of the roller, and consists, first, in making the barrel either of one piece of solid wood with the roller, or, if separate, of any of the substances above-mentioned; secondly, in an improved apparatus for holding and releasing the cord as required. *Patent completed.*

3269. W. H. Bailey. *Certain improvements in sewing machines.* Dated Dec. 31, 1861.

This invention is not described apart from the drawings. *Patent completed.*

3270 W. E. Newton. *Improved apparatus for obtaining motive power from explosive compounds.* (A communication.) Dated Dec. 31, 1861.

Here a cylinder is employed provided with two pistons, the rods of which pass through stuffing boxes or guides in the ends of the cylinder. An arrangement of valves is adapted to the middle part of the cylinder to admit the gases into the cylinder. The expansion of the gases when exploded will drive the pistons forward, and as the rods of the latter are connected to the lower ends of a pair of vibrating levers, which are suspended from suitable bearings, these levers are caused to vibrate on their centres, and by means of connecting rods they communicate rotary motion to a crank shaft. A fly-wheel and driving pulley are mounted on this crank-shaft, and, of course, rotate with it, and may be used for giving motion to any machinery. *Patent completed.*

3271. W. E. Newton. *Improved apparatus for boring rocks and other mineral substances.* (A communication.) Dated Dec. 31, 1861.

This invention is not described apart from the drawings. *Patent completed.*

3272 E. Liphaugne and D. Delbosque. *An improvement in advertisements.* Dated Dec. 31. 1861.

Provisional protection has not been granted for this invention.

3273. J. B. Cretal. *A new process of colouring smoking pipes.* Dated Dec. 31, 1861.

The inventor dips the pipes in a solution of alcohol, cashoo, and aloes, and he then puts them in an oven that can be heated to 300° centigrade. To colour the top of the pipe, or rather of its bowl, he dips it in a solution of milk and caramel (burnt sugar). The so-coloured pipes he varnishes with some carabee, and exposes them in an oven to a heat of 200° centigrade, or thereabout. *Patent abandoned.*

3274. E. T. Hughes. *Improvements in saddles.* (A communication.) Dated Dec. 31, 1861.

This consists in an arrangement of stops placed in an angular position upon the side of the saddle, so as to gather over the leg of the rider, and aid him in keeping down upon

his seat in resistance to either a sudden lateral movement of the horse, or to an abrupt check in his career; and also permit a very available support for the holsters of a military saddle, and to secure them certainty of position. *Patent completed.*

3275. R. A. BROOMAN. *Improvements in revivifying animal black or charcoal, in collecting ammoniacal gases generated in the revivification, in the clarification of saccharine liquors, and in apparatus employed in the revivification of the black, and in the filtering of saccharine liquors.* (A communication.) Dated Dec. 31, 1861.

This consists in revivifying animal black, or charcoal, by wet processes, hot water or steam, acting in the filtering vessels, whether for renewing its powers for absorbing lime, or for renewing its properties for absorbing azoted, ammoniacal, and colouring matters; secondly, in revivifying animal black by acids, to eliminate lime from defecated saccharine liquors; thirdly, in the clarification of saccharine liquors, juices, and syrups, by means of phosphates; fourthly, in certain different methods of revivification of animal black, which allow of the collection of the ammonia given off in the revivification; fifthly, in apparatus (which is not described apart from the drawings) for carrying parts of the invention into effect. *Patent completed.*

3276. A. and J. EDWARD. *Improvements in machinery or apparatus for spinning fibrous materials.* Dated Dec. 31, 1861.

The framing of this machine consists of the ordinary end standards or gables connected to longitudinal rails. The spindles are longer than those in ordinary use; they are carried in footstep and collar bearings in two stationary parallel rails in the usual way. The upper parts of the spindles pass through the movable rail or lifter, which is carried on sliding rods that are caused to descend as the yarn is wound on to the pirn. The spindles are driven in the usual way. At the part where each spindle passes through the lifter there is fitted in the movable rail a neck-brass or additional collar-bearing, which is screwed into the lifter, and on this neck-brass or collar-bearing the pirn rests. Behind the spindles, and in a plane above the lifter, is arranged a longitudinal rail, which rests on slide brackets. These brackets have at the lower part of each a rack, which is actuated by a pinion arranged opposite thereto on a horizontal shaft, which is driven from the upper gearing of the machine. The movable longitudinal rail has a pair of brackets bolted to its upper face, which carry a horizontal shaft, having fitted to it a pair of heart wheels. The peripheries of these wheels bear upon pulleys carried on the backward ends of two levers, which are centred on a bracket piece fixed to the traversing rail. This lever is connected by a link to a lifter, so that the motion of the heart-wheel gives a short vertical traverse thereto, and in this way builds up the cone of the pirn. *Patent completed.*

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1. J. M. ROWAN. *Improvements in the manufacture of railway wheels and in apparatus to be used therein.* Dated Jan. 1, 1862.

This has reference to a previous patent dated November 28, 1861 (No. 3,000), and consists in forming a dove-tail groove on each side of the rim of the spoke frame, the groove on one side fitting a dove-tail rim projecting inwardly from the outer edge face of the tyre, whilst a dove-tail groove is formed round the inside cylindrical face of the tyre near the inner edge face, and in this groove there is inserted a series of segmental keys, which are formed with duplex dove-tails, so as to be held firmly in the tyre groove, and to clip and hold the spoke rim by locking in the dove-tail groove formed upon it. To admit the segmental keys, the part of the tyre forming the outer side of the groove is cut away at intervals, and the keys are introduced at the cut away parts, and forced round under the uncut parts. *Patent abandoned.*

2. N. C. SZERELMEY. *Improvements in the manufacture of leather cloth or imitation leather, and in rendering certain fabrics waterproof.* Dated Jan. 1, 1862.

The patentee claims the use of the substance called zopissa in the manufacture of leather cloth, or imitation leather, and in rendering linen, woollen, and other fabrics waterproof. Also a mode of making leather cloth or imitation leather. *Patent completed.*

3. J. H. JOHNSON. *Improvements in hose pipe joints or couplings.* (A communication.) Dated Jan. 1, 1862.

Here according to one modification, it is proposed to use two metal cylinders or collars fitted respectively in any convenient manner to the ends of the hose pipes to be coupled. One of these cylinders or collars is made to fit easily inside the other, and has a beveled groove made round it, a short distance from its main extremity or end face, which face bears against a packing ring, or washer of any suitable material, inserted inside the larger or outer cylinder. An inner projection or flange, which is beveled to correspond to the level of the groove in the inner cylinder, is formed on the inner surface of the outer cylinder, and fits into the groove above stated. On the diametrically opposite side of the outer cylinder to that in which the internal projection is situate, there is a wedge, or screw plug passing through the cylinder, and through a collar thereon, and provided at its outer end with a suitable head for turning the screw, whilst the inner end of the pin or plug is tapered or beveled to fit the groove in the inner cylinder before referred to. In coupling the parts, the screw pin or plug is partially withdrawn, so as to allow the inner cylinder to enter the outer one freely, and pass its end over the internal beveled projection, so as to cause such projection to fit into the beveled groove; the screw plug is now caused to enter the groove on the opposite side by turning it either by hand or a spanner, the effect being to lock the two parts effectually together. *Patent completed.*

4. T. HALL. *Removing weeds from canals, rivers and lakes after such weeds have been cut with a chain scythe or other machine, or implement applicable to that purpose, which invention I intend to designate and call a "weed dredging machine."* Dated Jan. 1, 1862.

The extreme length of the specification of this invention precludes our quoting it here at sufficient length for an intelligible abstract. *Patent abandoned.*

5. J. WALKER. *Improvements in the construction of forts and fortifications which are applicable to floating batteries.* Dated Jan. 1, 1862.

The patentee claims, 1, constructing floating vessels, or batteries, or structures, so that they may contain one or more forts or gun towers revolving in or by water, and rising or falling in or by water, in a tank or other suitable structure formed in or by such vessel or structure. 2, armour-plates forged, rolled or planed, formed, and fitted, as described, and of all dimensions. 3, solid flanged or flanged and webbed prongs, forged, rolled or planed, and cut in the form described, with square and keyed, or with round and screwed ends, and of all dimensions. 4, moving the head or stern of a ship or vessel 'short round,' by a force pump or other power, for the purpose specified, and for steering. 5, the mode of forming timber and sheathing the hulls, decks, and roofs of vessels as described. And, lastly, the bridge-shaped ribs for vessels. *Patent completed.*

6. T. C. CLARKE. *Improvements in the construction of apparatus for heating and circulating water and other liquids.* Dated Jan. 1, 1862.

This relates to the construction of the bottom or the fore part of those apparatuses usually built in brick work, and known as cast boilers, such boilers being mostly used for heating and circulating water or oil through pipes or tubes for warming green-houses and other buildings. To obtain a large heating surface and economy of fuel, the patentee casts the said apparatus of a cylindrical form, with a water jacket around the same, and with hollow fire bars across the bottom, so that at the back of almost every part where the heat impinges there is a water space, and as all the water spaces communicate with each other, a circulation is maintained, as is well known. In the side of the cylindrical casing before named, there is an opening in the brick-work through which to supply fuel. Near the bottom there are water supply or return pipes, and near the top are the exit or hot water discharge pipes, which may be connected to another boiler placed above the one just described, so that the water may be further raised in temperature before discharged into the circulating pipes, and the waste heat economised. To prevent waste of fuel there is a cover or flue plate placed on the top of the boiler to prevent the heat escaping too rapidly, which may be regulated by the dampers. *Patent completed.*

7. JOHN BRADBURY. *Improvements in self-acting mules.* Dated Jan. 1, 1862.

This relates to improved modes of turning the cam shaft, and has for its object the prevention of breakages, and causing certainty of action. Instead of the ordinary friction pulley having four grooved cavities, and the escape lever and parts connected with it, the inventor uses, at the end of the cam shaft, a boss or plate having four teeth or projections, acted upon one after the other by a rod having at the end a small pulley. The said rod is moved upwards or forwards, at the required time, by four pins upon a revolving plate or pin wheel, put in motion by gearing communicating with the rim shaft. The pins on the pin wheel are adjusted at various distances apart, according to the required number of the twist of the yarn, and the blank part of the wheel allows time for the coming out of the carriage. The aforesaid cam shaft, after each movement, is held steady by a lever and lock wheel, and the movements are performed with ease and certainty. *Patent abandoned.*

8. R. A. BROOMAN. *Improvements in shears or scissors.* (A communication.) Dated Jan. 1, 1862.

This invention is intended chiefly to be applied for severing the large threads surrounding net, tulle, and machine-made lace, for which purpose ordinary scissors have been hitherto used. The invention consists in the arrangement of several pairs of cutting blades in one and the same instrument. Two plates, the lengths of which are regulated according to the number of cutting blades employed, are connected to handles; the cutting blades of the scissors are secured to the plates by screws inserted in slots formed in them; a guard-plate covers the heads of the screws which secure the upper cutting blade to prevent the threads catching in them. The ends of the upper blades are beveled, which, in combination with guides formed of thin metal connecting two adjacent cutting blades, guide the threads to be cut between the two blades. Springs between the handles keep the blades apart until pressure is applied to them. *Patent completed.*

9. R. A. BROOMAN. *Improvements in supporting and propelling vessels.* (A communication.) Dated Jan. 1, 1862.

This invention consists in supporting vessels on the water, and propelling them by means of two or more sets of drums, one set or all of which is or are armed with floats or paddles. The vessel may be cylindrical, and may be made conical, or of any other convenient shape, both at bow and at stern. It is supported clear of the water, but may be furnished with a keel entering the water. The paddle drums are driven by steam or other power contained in the vessel. The vessel may be suspended from the drum shafts by strong springs, similar to those used for locomotive engines. The vessels may be furnished with one or two rudders. *Patent abandoned.*

10. W. BUSH. *Improvements in omnibuses and other carriages.* Dated Jan. 1, 1862.

This consists, 1, in constructing omnibuses and other carriages with parts thereof double, so that the bottom, sides, and top may, when required, be drawn out, and afford increased accommodation. 2, in a method of constructing trucks and carriages, so that they may be used on rail or tramway and on common roads. *Patent abandoned.*

11. B. RHODES. *Improvements in forming or making straight and bent pipes, and bends for pipes, and also vessels, and in coating and protecting objects and articles of various forms intended to be employed for various purposes.* Dated Jan. 1, 1862.

This consists in using elastic fabrics in combination with bitumen or bituminous mastics or compositions, for the purpose of forming vessels of various kinds of regular and irregular shapes, and also covering or coating various articles and things for the purpose of protecting them, rendering them capable of resisting the action of moisture or atmospheric influence, as also for the purpose of rendering them more perfect non-conductors of electricity, as well as to render articles so coated subservient to other useful purposes. *Patent completed.*

12. E. BANFIELD. *Improvements in lubricating and maintaining in working order axle journals and brasses, applicable also to other journals and bearings.* Dated Jan. 1, 1862.

This consists in using hay, straw, grass, hemp, or hair, manufactured or unmanufactured, or the shavings or clips of wood, which are filled into or packed in the axle-box or reservoir containing the oil or lubricating fluid, used for lubricating and maintaining in working order, by capillary attraction, the working surfaces of journals and bearings. *Patent abandoned.*

13. W. B. PATTRICK. *Improvements in the manufacture of sugar, and in the apparatus employed therein.* Dated Jan. 1, 1862.

Here the patentee makes use of a closed vessel or vacuum-pan, and he heats the saccharine syrups or solutions therein to a low temperature, considerably below the boiling point, or 212° Fahr., by hot water, air, or vapour, caused to circulate in pipes in or around such vessel, or in the jacket or outer case thereof, combined with the use of air heated to about the same temperature forced through openings in a pipe or pipes, applied so that the air may be distributed amongst, and pass through, the syrup or solution, and thereby aid in driving off the aqueous particles contained therein in the form of vapour, which are then drawn off by the air-pump or other means. By these means improved colour and increased amount of crystals will be obtained with less molasses or treacle. *Patent completed.*

14. E. F. DAVIS. *Improvements in gas burners.* Dated Jan. 1, 1862.

The object here is to cause the gas, while passing into and through the burner, to become regulated and controlled with regard to its pressure, to be at the same time purified, its illuminating power increased, and its consumption economised. The lower part of the burner consists of a receptacle containing charcoal; above the charcoal a perforated cover or disc, having the edge furnished with a screw thread (immediately below which is a gauze wire to prevent the charcoal stopping up the perforator), is screwed down inside the receptacle, which has a corresponding thread cut therein, so as to form a cap, and force down the charcoal, as may be required according to the pressure of the gas. The upper part of the burner consists of a dome and a nipple screwed thereon, the interior and upper portion of the dome being furnished with a double layer of wire gauze, a similar duplicate layer being placed in the lower portion of the burner beneath the charcoal. The dome is to be screwed on the lower part of the burner, and the whole is then ready to be attached by a male or female screw at the bottom of the burner to the gas pipe. The gas will then pass through the layers of gauze, and through the charcoal and perforated disc into the dome, and through the upper layers of gauze into the nipple, becoming in its passage not only purified or rendered smokeless and increased in its illuminating properties, but regulated in its passage, and its consumption proportionally economised. *Patent completed.*

15. J. HOWARD and E. T. BOUSFIELD. *Improved apparatus applicable to steam cultivation.* Dated Jan. 1, 1862.

This consists, 1, in an improved snatch-block. The addition of a guide or friction-roller is made to the ordinary double snatch-block, which block, when in use, is placed in front of the windlass, the ropes being carried from the pulleys of the snatch-block in any required direction. It relates, 2, to the construction of double-action ploughs or cultivators to be operated by steam-power, and consists in an arrangement for suspending the ploughs out of work, and in a simpler and better arrangement than has heretofore been adopted for steering the implement. *Patent completed.*

16. W. E. NEWTON. *Improvements in coffee-pots and boilers for culinary purposes, part of which improvements are also applicable for generating steam.* (A communication.) Dated Jan. 1, 1862.

This consists, 1, in combining a coiled tube with a boiler, central tubes, and perforated food-holder or receptacle, so that, when the heat is applied to the apparatus or device, and the water commences to be heated, a circulation or current will be formed within the boiler, and the water very expeditiously heated and boiled, while the substance or material to be boiled or decocted will be disposed in the most advantageous manner in the current of water to favour the cooking or extracting process. 2, in using in connection with the boiler or coiled tube and food-holder, or receptacle aforesaid, one or more supplemental chambers or vessels, placed under and over the other, and communicating with each other and the boiler by a tube or tubes constructed and arranged to favour the ascent of steam or heated air, with the supplemental chambers for warming or cooking articles of food, and at the same time serve as a means to keep the cover or lid of the receptacle or boiler in proper position. *Patent abandoned.*

17. J. J. GUTKNECHT. *Improvements in meters for measuring gas, water, and other fluids, under any pressure, even the smallest, without making any change in the apparatus.* Dated Jan. 1, 1862.

The patentee claims, 1, the arrangement of fluid-measuring apparatus, in which the capacity of the measuring chamber is controlled by a piston and flexible diaphragm, by whose motion the quantity of fluid passing through the water is indicated and registered, all as described. 2, the arrangement of parts described as applied to a fluid meter, whereby the valve which regulates the admission and escape of the fluid to and from the measuring chamber is caused to change its position quickly at the completion of the stroke of the measuring piston or diaphragm by the action of springs placed in position for that purpose, as described. *Patent completed.*

PROVISIONAL PROTECTIONS.

Dated April 14, 1862.

1072. J. Childs, Victoria Street, Pimlico, gentleman. Improvements in the manufacture of wax matches.

Dated May 22, 1862.

1553. G. F. Göransson, Gefle, Sweden, iron master. Improvements in the construction and arrangement of armour plates, applicable to ships, forts, batteries, and other structures, and to a mode of securing the same.

Dated May 30, 1862.

1625. P. U. Payras, 15 Passage des Petites Ecuries, Paris, commission agent. Improvements in protecting dry or green hides from vermin.

1626. J. Gurrin, Stroud, Gloucestershire, woollen merchant. A new mode of telegraphic communication between separate buildings or parts of buildings.

Dated June 4, 1862.

1679. C. S. Cahill, 9, Gerrard Street, River Terrace, Islington, gentleman. Improvements in the manufacture of felted fabrics suitable for hats, bonnets, and other purposes.

Dated June 9, 1862.

1717. E. Hottin, 26 Rue de Rivoli, Paris, agent. A composition for rendering uninflammable linen, flax, silk, cotton, wood-work, and other articles or materials.

1722. A. J. Joyce, Cambridge Terrace, gentleman. Improvements in lighting and heating.

Dated June 12, 1862.

1747. I. Spight, Glandford Briggs, Lincoln, ironfounder and agricultural machine maker. Improvements in horse hoes

1749. A. A. Lerenard, 60 Boulevart de Strasbourg, Paris, practical engineer. A new and improved cement or mastic for making joints of steam, water, or gas pipes or chambers.

1753. B. George, Kingsland Road, gentleman. Improvements in the construction of portable beds, bolsters, pillows, and sofa and other cushions.

Dated June 13, 1862.

1755. W. Smith, 48, Briggate, Leeds, merchant. Improvements in apparatus for cutting or dividing soap.

1757. A. Longbottom, Hammersmith. Improvements in the manufacture of artificial stone.

1759. J. H. Glew, Howland Street, Fitzroy Square. Improvements in sewing machines.

1761. T. W. Fleming, 10 Lancaster Gate, Bayswater. Improvements in preparing charges for fire-arms.

1763. W. E. Newton, 66 Chancery Lane. Improvements in fire-arms, and in the attachment of bayonets or swords thereto. (A communication.)

1765. J. Ives, New York, U.S. Improved apparatus for expressing juice from fruit and other vegetable substances.

Dated June 14, 1862.

1769. J. Sawyer, Noble Street, engineer, and G. Padgham, Dalston, gentleman. Improvements in steam boiler and other furnaces, applicable in part to grates of various kinds.

1773. W. Bouch, Shildon, Durham, engineer. Improvements in cranes.

1775. W. Wighton, Edinburgh, watchmaker. Improvements in apparatus for regulating watches and other time keepers.

Dated June 17, 1862.

1796. J. Kellow and H. Short, Delabole, Cornwall, mineralogists. Improvements in the manufacture of blasting powder.

Dated June 19, 1862.

1805. A. Howat, Farnworth, near Bolton-le-Moors, Lancashire, brassfounder. Improvements in the construction of water gauges and blow-off taps for steam boilers and other purposes.

1807. W. Stokes, Birmingham, gun barrel rifler, and C. W. James, Birmingham, gun manufacturer, and J. Stokes, Birmingham, gun barrel rifler. New or improved machinery for stocking and screwing guns and pistols.

1809. C. Cartwright, 1 Liverpool Street, Moorfields. Improved means of stopping or retarding trains on railways.

1811. E. J. Davis, West Smithfield. Improvements in treating and preparing food for horses and other animals.

1813. W. Thomson, Thorney Gas and Water Works, Thorney, near Peterborough. Improvements in machinery for making bricks, tiles, and other articles.

Dated June 20, 1862.

1815. J. G. Dupuch, Paris, brassfounder. Improvements in cocks for regulating the supply of gas.

1817. W. E. Gedge, 11 Wellington Street, Strand. Improvements in the manufacture of candlesticks, and in machinery or apparatus used in such manufacture. (A communication.)

1818. J. Bedford, 52 Rue Charlot, Paris, manufacturer. Improvements in the irons and cutters of planes, and in the methed of manufacturing the same. (A communication)

1819. W. Malins, Pershore, Worcestershire. An improved protective covering for agricultural or other similar purposes.

1821. B. M. Mody, 4 Trafalgar Square. Improvements in varnish or polish

1822. J. W. Taylor, Newsome, near Huddersfield, manufacturer. Improvements in valves, and in means for regulating and indicating the flow and pressure of fluids.

1823. D. Middleton, Burton-by-Lincoln, agriculturist. Improvements in cranes for lifting weights into and out of carts, and for other purposes.

1825. A. Warner, Threadneedle Street. Improvements in the manufacture of pigments or paints from certain refuse materials.

Dated June 21, 1862.

1831. G. Simpson, Glasgow, civil and mining engineer. Improvements in machinery for working, boring, and mining or excavating tools, and mine and other pumps.

1832. H. and J. Davenport, Bradford, Yorkshire, reed and heald makers. Improvements in means or apparatus for the manufacture of loom healds or harness.

1833. J. Anderton, Accrington, Lancashire, manufacturer. Certain improvements applied to the tape-leg or sizing machine, and in the apparatus employed therein, for the purpose of improving the yarn.

1834. S. Holman, 18 Cannon Street, engineer. Improvements in pumps and valves.

1837. J. H. Redstone, Indianapolis, Marion, U.S., engineer. Improvements in the construction of boilers of steam engines. (Partly a communication.)

1841. E. Edmonds, Berryfield, Wilts. Improvements in the manufacture of felted articles and fabrics, and in the apparatus employed therein. (Partly a communication.)

Dated June 23, 1862.

1843. H. McKenzie and P. Ramsay, Glasgow, manufacturers. Improvements in cylindrical or circular brushes or rollers for various manufacturing machines.

1844. H. Ponsonby, Liverpool, provision merchant. Improvements in top sail sheet bits or bolts.

1847. W. Barr, Coventry, designer. An improved manufacture of raised or brocaded fabrics woven in cotton or flax, either alone or in combination with wool.

Dated June 24, 1862.

1849. A. Ripley, Brook Street, West Square, Lambeth, engineer. Improvements in the construction of damper governors or regulators.

1850. W. Hargreaves, whitesmith, and G. H. Leather, worsted spinner, Bradford, Yorkshire. Improvements in machinery or apparatus for combing wool, hair silk, cotton, flax, and other fibrous substances.

1851. T. Carr, New Ferry, Chester, glue manufacturer. An improved machine for grinding, kneading, washing, and other like purposes.

1853. G. Collier, Halifax, and J. W. Crossley, Brighouse. Improvements in means or apparatus for hot pressing, which improvements are also applicable to other heating purposes.

1857. E. C. Nicholson, Atlas Works, Locksfields, manufacturing chemist. Improvements in the preparation of colouring matters applicable to dyeing and printing.

Dated June 25, 1862.

1859. M. A. F. Mennons, 24 Rue du Mont Thabor, Paris. Improvements in steam boiler furnaces. (A communication.)

1861. J. Blair, Caledon Mill, Manchester, wadding manufacturer. Improvements in the manufacture of wadding.

1863. G. Haseltine, 100 Fleet Street, American barrister-at-law. Improvements in vaporising lamps, for burning petroleum or coal oil. (A communication.)

1864. F. Tolhausen, 17 Rue du Faubourg, Montmartre, Paris, civil engineer. An improved lock or locking apparatus. (A communication.)

1867. E. H. Huch, Brunswick, and F. J. Windhausen, Duderstadt, Hanover. Improvements in caloric engines named 'fire-air engines.'

1869. G. Turner, 13 Rose Terrace, Brompton, machinist. Improvements in mincing apparatus, such improvements being also applicable to machines for grinding coffee and spices.

1871. W. Clark, 53 Chancery Lane, engineer. An improved frame for holding photographic pictures. (A communication.)

Dated June 27, 1862.

1884. E. Hunt and H. D. Pochin, Salford, chemists. An improved condensing apparatus.

1886. J. Lord, Todmorden, machine maker, and J. Brown, Burnley, overlooker. Certain improvements in power looms for weaving.

1888. R. A. Brooman, 166 Fleet Street, patent agent. A method or methods of preparing paper for the reception of photographic pictures or impressions, in order that the said pictures or impressions may be transferred to and fixed on wood, porcelain, and other surfaces. (A communication.)

Dated June 28, 1862.

1898. J. Garnier, Devonport, lieutenant in the Royal Engineers. Improvements in ordnance and in projectiles.

1904. N. Thompson, 15 Abbey Gardens, St. John's Wood. Improvements in apparatus for stopping bottles, jars, and other vessels, and in instruments for applying and removing such stopping apparatus.

Dated July 1, 1862.

1914. J. Parkinson, Bury, engineer, and J. Marsland, Newchurch, engineer. Improvements in apparatus for regulating the flow and pressure of steam and other fluids.

1916. E. Pourpoint, 15 Passage des Petites Ecuries, Paris, linen draper. An improved wool washing machine.

1918. C. Lungley, Deptford, ship builder. Improvements in constructing, building, and working floating docks and other floating bodies, and in pumping apparatus to be employed therein.

1922. J. M. Dunlop, Manchester, engineer. Improvements in cotton gins.

Dated July 2, 1862.

1926. J. James, Uskside Iron Works, Newport, manufacturer. An improved mode of welding railway crossings.

1928. B. Johnson, Chester, engineer. Improvements in rope wheels for mines, collieries, and other similar purposes.

1932. J. Steel, Stirling, plumber. Improvements in water-closets.

1934. J. Webster, Birmingham, engineer. Improved apparatus for the manufacture of gas for illumination.

1936. J. M. Hetherington, Manchester, machine maker, and T. Jackson, Stockport, manager. Improvements in machinery or apparatus for preparing, spinning, and doubling cotton and other fibrous materials.

Dated July 3, 1862.

1938. G. H. Birkbeck, 34 Southampton Buildings, Chancery Lane, engineer. Improvements in the construction of mechanical horses. (A communication.)

1940. W. M. Williams, Handsworth, Staffordshire, teacher. Improvements in apparatus for the distillation of coal and peat and such other substances as are or may be used for the manufacture of solid and liquid volatile hydro-carbons.

1942. T. O. Dixon, Steeton, bobbin manufacturer. Improvement in means or apparatus for heating or warming rooms or buildings with steam, and in carrying off the condensed steam or water therefrom.

Dated July 8, 1862.

1967. O. W. Child, New York. A new and useful composition to be used in shaft journal boxes. (A communication.)

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

562. A. E. Ragon. Electric alarums. (A communication.)
563. A. Potts. Vegetable substances.
564. P. Robertson. Manufacture of ammoniacal salts.
566. J. G. Jennings. Construction of chimneys or flues.
568. L. Martin. Candle lamp.
576. J. Schofield. Looms.
579. A. Bedborough. Pillar letter-boxes and letter-bags.
586. J. Ellis. Fastening chains.
588. P. and F. Schafer. Travelling bags.
604. J. Barker. Casting drums, pullies, gear, and other wheels.
607. J. G. Shipley. Bridle-heads, reins, and bits.
608. M. B. Newton. Drain pipes.
609. T. Farrimond. Safety cage.
611. J. Carpendale and T. Middleton. Chasing on copper.
613. T. Ball, W. Ball, and J. Wilkins. Warp fabrics.
614. R. Wright. Heating and clarifying saccharine fluids.
622. A. Blair. Rotatory engines.
623. W. Paterson, W. A. Sanderson, and R. Sanderson, jun. Finishing woven fabrics.
625. J. Platt. Cleaning cotton from seeds.
626. J. Deane. Revolving fire-arms.
631. W. Palmer. Manufacture of candles.
632. J. Fleming. Pressing cotton. (A communication.)
640. R. A. Brooman. Producing drawings by the aid of photography. (A communication.)
656. O. and J. Kerautret. Construction and ornamentation of buildings.
657. E. G. Camp. Brushes.
659. T. B. and W. Wilson. Splitting cane.
664. A. René Le M. de Normandy. Connecting gas and other pipes.
673. P. Gondolo. Baking oven.
679. W. E. Newton. Manufacture of cartridges. A communication.
684. J. Hunter. Apparatus for removing slag from furnaces
695. J. B. Howell. Manufacture of chains and chain cables.
701. A. Quinard. Horse shoe nails.
707. G. T. Bousfield. Machinery for digging and disintegrating the earth. (A communication.)
713. H. Emanuel. Manufacture of ornaments.
731. L. P. Mongruel. Cold vapour generator.
732. W. Bowser. Ships' fire hearths.
754. A. A. Beaumont and J. A. Escalier. Flying top.
1084. A. V. Newton. Manufacture of blasting powder. (A communication.)
1178. G. N. Bates. Dressing lace and other fabrics.
1189. W. E. Newton. Manufacture of imitation lace, net, or open-work fabrics. (A communication.)
1215. J. Shaw. Engines and indicators. (A communication.)
1559. J. Ward. Manufacture of textile or looped fabrics.
1733. J. G. Appold. Regulating the discharge of water and other liquids, and air and other gases.
1775. W. Wighton. Regulating watches and other timekeepers.
1830. J. Taylor. "Doffer" or "stripper" for carding engines for preparing cotton and other fibrous substances.
1850. W. Hargreaves and G. H. Leather. Machinery or apparatus for combing wool.
1886. J. Lord and J. Brown. Power looms for weaving.
1967. O. W. Child. Composition to be used in shaft journal boxes. (A communication.)

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed July 11, 1862.

107. S. W. Marsh.
108. T. Harrison and J. G. Harrison.
109. C. Hill.
115. J. Ridsdale.
116. H. D. P. Cunningham.
161. M. Henry.
218. M. A. F. Mennons.
281. M. A. F. Mennons.
573. P. Remond.
635. F. R. Newton and H. Codd.
818. M. A. F. Mennons.
1070. J. Dargue.

Sealed July 15, 1862.

119. E. H. C. Monckton.
130. J. Tow.
135. J. J. Stevens.
137. S. Dreyfous.
139. T. Roberts and J. Dale.
143. T. W. Jobling.
145. A. Lamb and J. White.
146. J. Bird.
149. R. O. Doremus and B. Lum Budd.
153. C. Binks.
157. J. H. Rawlins.
164. I. Roberts.
172. J. Wallace.
174. W. H. Ropes.
220. A. H. Church.
270. L. Fauvel.
287. W. E. Newton.
304. H. Ashworthe.
318. E. T. Bellhouse and W. J. Dorning.
386. J. F. Lawton and J. Lawton.
644. A. C. MacLeod.
697. W. E. Newton.
928. A. V. Newton.
1028. G. D. Mertens.
1439. G. Blake.

PATENTS ON WHICH THE THIRD YEARS' STAMP DUTY HAS BEEN PAID.

1617. W. Robinson.
1640. W. H Dawes.
1631. J. Taylor.
1632. T. D. Duppa.
1642. J. Smith.
1652. J. Luis.
1686. O'D. Grimshaw.
1654. T. Wright.
1662. J. Taylor.
1668. J. Morgan.

PATENTS ON WHICH THE SEVENTH YEARS' STAMP DUTY HAS BEEN PAID.

1566. J. H. Tuck.
1614. W. Smith.
1562. J. Caldow and J. B. A. McKinnel.
1577. R. Yeates.
1593. J. B. Pascal.
1608. W. C. Thurgar.

LIST OF SPECIFICATIONS PUBLISHED,

During the Week ending July 11, 1862.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s. d.		s. d.		s. d		s. d.		s. d.		s. d.
2122	0 7	3035	0 6	3047	0 3	3059	0 3	3071	0 3	3083	0 10
3024	0 4	3036	0 3	3048	1 7	3060	0 5	3072	0 6	3084	0 3
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3026	0 6	3038	0 3	3050	0 3	3062	0 3	3074	0 3	3086	0 3
3027	0 5	3039	0 3	3051	0 3	3063	0 3	3075	0 4	3087	0 5
3028	0 3	3040	0 10	3052	0 6	3064	0 3	3076	0 3	3088	0 3
3029	0 10	3041	0 6	3053	0 3	3065	0 10	3077	0 3	3089	0 6
3030	0 3	3042	0 10	3054	0 3	3066	0 10	3078	0 11	3090	0 3
3031	0 6	3043	0 3	3055	0 8	3067	0 7	3079	0 8	...	...
3032	0 5	3044	0 6	3056	0 3	3068	1 6	3080	0 3	...	...
3033	0 7	3045	0 4	3057	0 10	3069	0 3	3081	0 4	...	...
3034	0 5	3046	0 4	3058	1 1	3070	0 3	3082	0 4	...	...

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, JULY 25, 1862.

THE CONSTITUTION OF THE ADMIRALTY.

In the history of the world, from the earliest ages up to modern times, mystery has been one of the most, if not the most, powerful means of government. The Lama of Thibet in his inscrutable nonentity, the veiled prophet, the Council of Ten, the terrible tribunal of Loyola, the eccentric brotherhood of Freemasons and Odd Fellows, have, through the agency of the unknown and the incomprehensible, exercised unbounded influence over their followers, their suppliants, or their victims, and gained power or popularity by the inscrutable character of their organisation and proceedings. But of all the mysterious institutions which ever existed and afforded food for the historian, the poet, and the dramatist, there is none to be compared to the English Admiralty for the profound intricacy and hopeless impenetrability of its mode of conducting the naval administration of this country.

The number of communications we receive from persons who have suffered cruel neglect from the dull routine of that department, and the facts which have come to light in connection with the revolution in naval construction which is now in progress, lead us to believe that we shall render a great public service by laying bare the mysteries of Admiralty mismanagement.

At this moment there is no question of more vital importance to the nation than the reconstruction of the navy. If she is to maintain the empire of the seas, England must possess the best appointed and most efficiently protected armour-plated fleet in the world. We have published much on this subject; but, in the end, we know our countrymen will acknowledge that there never was a case that required a more vigilant supervision than the manner in which the public money is wasted and the national security imperilled, by the incapacity of the officials in the naval department to grapple with the vast undertaking of constructing iron-cased men of war. Under the mask of pompous formalities and unmeaning routine, with the aid of parliamentary effrontery, absurd blunders are committed and concealed; great authorities, as they are termed, gain the official ear, and, by not opposing the prejudices of the Controller's department, secure their own ends; whilst the counsels of able men, expressly appointed to advise the Admiralty, if they do not coincide with the views of the executive, are wholly disregarded.

Having made these introductory remarks to arrest the attention of our readers, we come to facts.

Something has already been made public, by recent experiments at Shoeburyness, about the terrible blunder of the Government constructors in the plan of armour-plating a new class of frigates exceeding the Warrior in dimensions, power, and expense. Four vessels of this class are under construction, namely, the Minotaur, the Northumberland, the Prince Albert, and the Agincourt, and will cost more than a million. Other classes of iron-mailed ships are being constructed, including Mr. Reed's singular combination of wood and iron.

In defiance of past experience, Government have repeated the folly of adopting modes of construction and systems of armour-plating without making any previous trial. With the history of the Warrior before them, it is inconceivable how the Admiralty can again commit so great an error. We are naturally led to consider what is the cause of this neglect of duty, and we have been at some pains to investigate the subject. The result of our inquiry is not satisfactory. The construction of the Warrior without any previous experiment trials; the mistakes in some of her arrangements, which target trials at a small expense would have prevented; the never-ending alterations in some parts of her structure; the alarming accounts of her inefficiency as a fighting and a sea-going ship; the mystery and contradictions about the experiments at Shoeburyness, of which the object is to test the relative value of guns and iron armour, and improve the construction of both; the hasty and inconsiderate adoption of designs for the new classes of ships referred to — all these circumstances, carefully passed in review, bring us to the conclusion that in the administrative and executive departments of the Admiralty there exists an amount of prejudice, a want of practical knowledge in iron ship-building, and a total absence of engineering ability, or experience for the construction of naval armour, which are obstructive to improvement, damaging to the national interests, and the source of extravagant and wasteful expenditure. For these evils there is no remedy but a radical reform and reorganisation of the Admiralty.

Some of the abuses of the system are so manifest, they only require to be mentioned to become apparent. The Lords' Commissioners, that is, the administrative branch, refer all questions of construction to the Controllers of the Navy, who represent the executive branch, where it is considered that all the constructive knowledge, scientific and practical, requisite in naval architecture, is concentrated. But, in fact, what is the composition of that department? We find in it a valuable accumulation of knowledge in wooden ship-building, founded on careful training in the school of naval construction, and practical experience in the Government dockyards. The officials, who by merit or seniority have been promoted to the head of the constructive department, and who, in fact, are its directors, under nominally the orders of the Controller, are disciples of the wood school, believe in wood, are prejudiced against iron, and have no knowledge of iron naval architecture but what they have picked up in the yards of iron ship-builders. They are learning their lesson in iron, and no doubt have made the most of their opportunities, but they are not competent to direct the counsels of the Admiralty for the construction of iron ships. When we come to naval armour, the important discovery of yesterday — which is engineering science of the highest order — the deficiency is greater, in fact, absolute. Its first elements are not understood; how should they be? How can men, who have passed their lives in learning the theory and practice of the construction of wooden vessels, know anything about iron ships or iron armour? One might as well expect a carpenter or a joiner to be an adept in a blacksmith's or an engineer's work. The Controller of the Navy is not expected to be a practical ship-builder or an engineer.

This statement of facts gives us an insight into the secret working of our naval administration. The Lords refer every technical matter relating to naval construction to the Controller; the Controller refers to assistant officers who are incompetent to give sound advice on iron ships or naval armour; and the result is what might be expected, that, with the utmost good will on the part of these official counsellors, the opinions they hold and the conclusions they come to are not reliable.

To do the Lords' Commissioners justice, they are perfectly aware of the inadequacy of the Controller's department to come to right conclusions, or to give good advice on many points relating to iron ships and naval armour. In order to enable the Admiralty to obtain sound practical information on the matters which the Controller's department do not understand, the special committee on iron, composed of men whose aptitude for the duties which devolved upon them, were so warmly and deservedly eulogised by the Secretary for the Admiralty, a consulting committee of four eminent iron ship-builders, and a special committee on coppering iron ships, were appointed, and experiments with guns on iron plates at Shoeburyness and Portsmouth, have been carried on extensively, under the direction of the first-named committee.

When, however, we come to investigate the proceedings of the Admiralty in constructing armour-plated men-of-war, we find them characterised by a lamentable perseverance in the old system of reference from the Lords' Commissioners to the Controller's department, and an almost total disregard, in a practical sense, of the valuable teachings of experiments comprised in the reports and recommendations of the committees which were formed for the guidance of the Admiralty.

The reason of these results — or rather no results—is departmental jealousy. The public service is suffering so greatly, and the public money is wasted so lavishly, the truth must be spoken. The only means of overcoming these evils, which are the cancer of the national exchequer, is a reconstruction of the department which, by the mere *vis inertia* of obstruction, puts a stop to improvement, spends millions in waste, and impedes the development of correct and intelligent principles for the construction of an iron navy on a sound, durable, and economical plan.

To prove that the view here presented of Admiralty administration is not unfounded or overdrawn, we will give a few illustrations.

When, more than two years ago, it was decided to construct armour-plated iron ships, the most eminent iron ship-builders, at the request of the Admiralty, sent in designs for the new class of men-of-war. We have the testimony of Mr. Laird, one of the firms which furnished designs, that no attention was paid to the plans and suggestions of himself and other practical ship-builders; but the Warrior-type, designed by the Controller's department, was adopted as the plan of construction for six large vessels, which were ordered to be laid down about the same time. There are differences of dimensions, form, and armament in these vessels, but in the main features of their construction they are all alike. The ordinary plan of iron ships built for the commercial navy was adopted, without any provision for strengthening the frames and skin in the manner required by the enormous weight of armour which they had to carry. The system of armour-plating was a fac-simile copy of that of the La Gloire, fastened with through-bolts to timber backing, and the addition of what was considered a great improvement, tonguing and grooving the edges of the plates.

Before these six vessels were built, and up to the time of launching all of them, no experiment was made to test the efficiency of a system which was applied to them simulta-

neously at an expense of nearly two millions. Any private speculator on a scale not so colossal would have made some trials before embarking his capital; but this thought never occurred to the Admiralty. Many months after the Warrior was at sea, the experiments of the iron-plate committee gave rise to misgivings in the Admiralty mind. A section of the Warrior was constructed as a target and submitted to the fire of artillery at Shoeburyness. The force of heavy projectiles soon showed the defects of the mode of armour-plating adopted. The supposed improvement of tonguing and grooving turned out a serious blunder: it had cost an extra expense of some £10,000 or £12,000 for the Warrior, and as much more for every other ship to which it was applied. This sum would have been saved if a Warrior target trial had been made before the plan of tongueing and grooving was finally adopted. The through-bolt fastening and perforation of bolt holes in the plates are recognised as the source of destruction to the plates; and the wood backing affords no support sufficient to prevent the armour plates being bulged, driven into the wood at the places struck, and buckled at the ends. The frames and skin were ascertained to be too weak for the weight of armour hung upon them by the points of the bolts. Two years ago a few thousand pounds spent in experiments would have solved all these points and saved immense sums, for we see it looming in not a very remote future, that every vessel cased with iron on the plan of the Warrior will have to be stripped of her armour and protected with a better devised system.

One would have thought that this experience would have brought the Admiralty to a more rational mode of proceeding, but the blindness of routine is incurable. Six more iron-clad ships are being built, and, regardless of the warnings of the experiments at Shoeburyness, the Admiralty have ordered them to be covered with armour plates on the Warrior plan, with the exception of relinquishing tonguing and grooving, reducing the thickness of the teak backing, and increasing that of the armour plates; but the objectionable methods of fastening with through-bolts, perforating holes in the plates and wood backing, are retained. The lessons learnt by the experiments on the Warrior section are thrown away; but, what is worse, insurmountable obstacles are opposed to promising plans *recommended by the iron-plate committee.*

It will be alleged that several plans of armour-plating have been tried with targets, ordered by the Admiralty, including those on the Fairbairn, Samuda, and Scott Russell systems, and not one of them have been proved to possess powers of resistance equal to those of the Warrior section. This is only partially true, and, if established as a fact, it does not prove that no better plan can be discovered, nor does it justify a reckless perseverance in an avowedly imperfect system, without a trial of other plans which have long ago been submitted to the Admiralty and recommended for trial by the iron-plate committee.

It is a fact which we are enabled to make public on undoubted authority, which demands the most serious scrutiny, that the committee, in their report, which is so mysteriously withheld, recommended five plans of naval armour for trial, neither of which the Admiralty has ordered to be tried. On this matter there is a state of antagonism between the committee and the Controller's department, the grant of money to try the plans approved by the former being refused on the ground of economy; but no thought is taken of the extravagant experiment of armour-plating ships on a plan acknowledged to be defective.

The parsimony which appropriates hundreds of thousands of pounds to repeat a system known by trial to be ineffective, and refuses the funds for experiments on well-considered plans, may truly be said to be "straining at a "gnat and swallowing a camel." We shall return to this subject, and show how the sanction of the Admiralty for target trials at the public expense is obtained in some cases and withheld in others.

INTERNATIONAL EXHIBITION.

MARINE ENGINEERING.

Now that the Jurors' Awards are made, we may fairly enter into a minute examination of what the Exhibition presents to us as examples of the marine engine practice of the present day; at least, as respects this country and several of the most important seats of manufacture on the Continent. We have reserved our remarks upon this subject—one of the most important which any mechanical journal can consider—not only on account of the numerous additions which have from time to time been made to the collection, both in the way of drawings and models, since the day of opening, but also in order that we may do justice to those who, from one cause or another, were unable to present their plans either upon the scale, or in the form best fitted for attracting the attention of the jurors, or, lastly, within the time specified in which the jurors' reports had to be completed, and their awards made.

We do not for a moment mean to insinuate that the jurors, in the execution of their arduous duties, did not fairly consider the various objects to which their attention was called, or that they willingly or purposely overlooked anything exhibited at the time their examinations were made; but we do know that in several cases, from omissions in the catalogue, as also from the absence of any systematic plan of inviting *every* exhibitor to meet them to explain his production, no small amount of injustice has been done. We also know that, upon the attention of the jurors being called to some of these cases, they have subsequently expressed their sincere regret that means were not adopted for bringing to their knowledge any omissions prior to the termination of their labours, which they were unable to extend beyond the middle of last month, with the single exception of a few extra days given to examine objects sent from some of the colonies, the arrival of which had been unavoidably delayed.

Each exhibitor has sent, if not what he liked, at least what he could; and unless those for whom some of the marine engines have been made had been willing for them to be sent to the Exhibition, either the manufacturer would not have exhibited anything, or else what now is represented by a 400 or 600-horse power engine would have simply been shown in a model or a drawing. The means, or want of means, of some of the exhibitors, has had much to do with the mode in which the things they have exhibited are presented to the public. Those who could not or would not afford to make engines of any size, contented themselves with models or drawings, the models being either of a showy or attractive character, and exhibited in motion, or of a more humble nature, made of wood and without arrangements for showing them at work.

Now, although we have no desire of blaming the jurors for either much they have done or left undone, we cannot fail to notice that most of the exhibitors of marine engines, and, indeed, of articles of all kinds as well in the marine engine class as in other classes, who have exemplified their manufactures by very large and imposing pieces of workmanship, have invariably been the most successful in obtaining favourable notice from the jurors. Yet it will be seen at once that such machines mostly represent only what has been done over and over again; not that they are the less valuable articles for exhibition on that account, perhaps, but still calculated to throw unduly into the shade such productions as are of a more progressive nature, and which are more often represented by models or drawings.

We do not forget that the manufacturer of an article well made and fully answering its intended purpose, however old in design that article may be, might fairly have a medal awarded to him; although the originally understood condition of space being given, was that the article exhibited should have been produced since 1851. What we object to is, that proposals for constructing engines or other things in a new way or on a new plan, should have been so suspiciously looked upon by the jurors, as they evidently have been. It is true that in the instructions given to them, they were specially warned not to award medals for untried inventions, except with the utmost caution, so that we must blame the Commissioners rather than the jurors, although there are many signs of the jurors having acted upon these instructions with unnecessary exactness.

It is almost needless for us to inform our readers that new projects do not often emanate from well-established manufacturers in any trade. Their interest mostly lies in repeating, in the greatest numbers possible, whatever they manufacture; loss of time, extra cost, to say nothing of mental labour, being more or less involved, and sometimes very deeply involved, in the production of new machines, or the introduction of new features in old ones. We do not deny that, as a matter of trade policy, the opposition of many manufacturers to change, or the improvement of engines or tools made by them, is right; but this fact only renders it of the greatest possible consequence, that in awarding prizes upon occasions such as the present Exhibition, the judges should pay the most minute attention to new projects exhibited, not passing by anything, however roughly or inadequately represented, until they have well examined it and ascertained its merits or otherwise. These gentlemen would, no doubt, repudiate with great indignation the idea that they had in any case done this, but we happen to know that they have done so, although we frankly admit that they have done so unwittingly.

We shall next week show in what instances signs of this disrespect, for *schemes* as they are frequently invidiously called, are apparent, merely observing now that in no case have the jurors stumbled over a 600-horse power engine without being made fully aware of its existence. In judging of the merits of any machine, we fully admit the immense amount of responsibility which the knowledge of the fact of its being the tenth, twentieth, or fortieth, made from the same patterns, at once removes; and we feel fully also the responsibility of expressing an opinion on an untried arrangement, be it for what purpose it may. If there are some people who like to think, there are, doubtless, many more who prefer not having to think at all—who most willingly hand this work over to those who, they are willing to persuade themselves, are much better able to decide upon difficult questions than themselves. Who,

in having to judge of the merits of a marine engine, for instance, would not feel a great weight removed from his shoulders if he ascertained that Messrs. Maudslay or Penn had adopted it or approved of it? Without for a moment suspecting himself of deferring to authority, or of not exercising his independent judgment in the matter, we can hardly doubt that a person, however competent he might be to form a correct opinion himself, would much more readily arrive at a conclusion and with infinitely less trouble, than he would do were the knowledge of the fact referred to withheld from him. He would, in reality, have had more than half his work done for him, so leaving him a comparatively easy task to perform. This respect for authority it is, of course, very difficult to avoid feeling, although, whenever things have to be judged of on their own merits, it would be highly desirable that the judges should know as little as possible of either the makers or the number made.

We think it would not have been too much to expect the jurors of the several classes to go fully into, and express an opinion of the probable advantages of, arrangements proposed, although they might never have been practically carried out. In awarding a medal for an untried invention, they could have stated in every case the circumstances under which their approval was given, and by this means avoided the risk of setting an undue value upon any article whose efficiency had not been proved. We are aware that the executive of all our scientific institutions combine in setting their faces against communications on proposed undertakings, as against those descriptive of what has actually been done; but we protest strongly against this disinclination to examine schemes. If an engineer, upon being called upon to design, say a machine for an entirely new purpose, or to improve an old machine, does so to the best of his ability, and is then desirous of submitting his plans to his professional brethren before incurring the expense of carrying such plans into execution, we maintain that the rules of no society should prevent his doing so; and further, that it is the duty of those who belong to such societies to give him what aid they can in suggesting alterations in his design, if such shall appear to them desirable. It is no answer to this idea of the duties of the elder members of scientific societies, to say that few engineers would avail themselves of this mode of testing the probable soundness of their views: this may be so, but in many cases it would save both much useless expense and anxiety. The well-known fact, that communications of the kind referred to are almost universally discouraged, prevents persons making any attempt at offering them.

When a thing has been made, and tried, and found successful, it is, of course, of immense importance to professional men to know the particulars and results; but is it not also of equal importance that engineers should discuss the best modes of working out problems as yet unsolved? We have little need for discussion about plans the success of which practice has confirmed; it is schemes, and those almost alone, that need it.

About 240 tons of iron ore are raised daily for shipment at the Jackson mine, Marquette, Lake Superior.

Iron sleepers have been laid down on the Madras (Indian) railroad, in place of wooden sleepers. It has been found that wooden sleepers decay so rapidly in tropical climates, that iron has been resorted to as a more economical material. This railroad is 406 miles in length, and stretches across the Indian Peninsula from Madras to Beypoor.

THE POST OFFICE.

A LECTURE BY MR. COMMISSIONER HILL, RECORDER OF BIRMINGHAM.*

THE first indication of a letter post is stated by German authors to have been found in the republic of the Hanse Towns as early as the thirteenth century. Shortly afterwards it was adopted by the Teutonic knights, who, like him of the "Canterbury Tales," made war on the infidels in Lithuania and the adjacent districts eastward. We may next trace a line of posts in the Tyrol, laid down in the reign of the Emperor Maximilian, who naturally desired to connect Lombardy with his Austrian dominions. The merit of this project is given by historians to the Lombard princes of the house of Thurn and Taxis, as they were designated after their removal to Germany. Under the Emperor Charles V. they established a line from Vienna to Brussels, thus connecting the Empire with its outlying possessions in Flanders. Until the reign of Henry VIII., letters in England were conveyed by special messengers—sometimes on foot, sometimes on horseback—and, again, by carriers, who, as we learn from Shakespear, had no relays, the same horse either carrying its pack or drawing its cart from day to day. How far England was behind some other nations in very important social arrangements, is indicated by the circumstance that long before we had a post for inland letters, the foreign merchants resident here enjoyed a stated interchange of correspondence with the Continent. This undertaking had its origin during the reign of Henry VIII., or prior to its commencement. In that of James I., from a complaint by the English merchants that the foreign postmaster delayed their letters, the King took the appointment into his own hands. It might be fairly presumed, even in the absence of direct evidence, that the postboy who carried despatches or accompanied the traveller during a stage of his journey to take back the post-horse, would be induced now and then to carry a private letter, so that in the course of years a usage profitable to all parties would grow up, which would engraft a letter post (of a rude kind, perhaps) on a system which the law intended only for despatches and for travellers. The hypothesis is confirmed by history, and this practice eventually became so extensive as to attract the attention of the Government. The years 1635 and 1637 witnessed the issue by Charles I. of his famous proclamation establishing our post-office on its present foundation, and directing that it should extend to Scotland and Ireland. The merit of this enterprise would seem to belong to Thomas Witherings, who was appointed first Inland Postmaster-General, he being already one of the masters of the foreign post. Soon afterwards the ever-memorable troubles of that unhappy reign broke out. The proclamations had claimed for the Crown a right of monopoly. It will create no surprise to learn that this prerogative was questioned by Parliament; nor that when the Houses became paramount over the King, they confirmed the monopoly, transferring it, however, to themselves, and closed a rival post-office which, after Parliament had contested the Kings's right, had been set on foot by the City of London. As the conflict between the Parliament and the City (no such unequal combatants in those days as they would be in the present) would call for legal knowledge on the part of the Postmaster-General, his office was united to that of Attorney-General, in the person of Mr. Prideaux. He claimed, probably with justice, the credit of having so improved and expanded the system as to make it not only self-supporting, but even to yield a profit. Taught by the success of the City enterprise, he lowered the rates of postage and increased the frequency of despatches, thus evincing that he not only apprehended, but acted upon principles which, although they have ever since received lip-homage, have too often been disregarded in practice, official men preferring immediate petty gain to large profits in the not distant future. In spite of great deficiencies in the service, the revenue of the Post-office, says Lord Macaulay, was from the first increasing.

In the year of the Restoration the net receipts were estimated at about 20,000*l*. At the close of the reign of Charles II., the net receipts were little short of 50,000*l*., gross about 70,000*l*. But the proceeds came partly from the monopoly of post-horses, which was a considerable source of profit. About the year 1683, Robert Murray, an upholsterer of London, set up a Penny Post, which delivered letters and parcels six or eight times a day in the busy and crowded streets near the Exchange, and four times a day in the outskirts of the capital, the Royal Post-office having made no provision for correspondence between one part of London and another. This undertaking he assigned to William Dockra; but as soon as it became clear that the speculation would be lucrative, the Duke of York, on whom the whole net revenue of the Post-office had been settled by his brother, complained of the Penny Post as an infraction of his monopoly, and the courts of law decided in his favour. Murray's invention was thus wrested from Dockra, and its profits went to swell the income of the Duke. The fusion of the two systems was imperfect, the letter-carriers belonging to each being still confined to their former duties, so that they would often be found in the same street, and not seldom would meet at the same door; whereas if one had handed over his letters to the other, and had then retired, the work might have been performed just as well. It would hardly obtain belief, but for the notoriety of the fact, that this waste of labour, which to the public was a waste of money constantly increasing, survived to the year 1854. So dear, from long association, had this absurdity become to official men, that although it was attacked in the report of the Commissioners of Inquiry as early as 1829, and although its abolition was an object of earnest desire with the author of Penny Postage, who included the change in his proposal when he submitted it to the nation and to Parliament, yet it was not until fourteen years after he entered upon the administration of the Post-office that he was enabled to overcome the impediments which the usage of nearly two centuries had accumulated in the way of this obvious improvement. Until 1720 the lines of postal communication had been radial from each metropolis of the three kingdoms, the number of cross-posts being comparatively few. But in that year the well-known Ralph Allen, then at the head of the Bath Post-office, made a contract with the Government to establish a cross-post between the cities of Exeter and Chester, by way of Bristol, Gloucester, and Worcester, thus connecting the West of England with the mail route to Ireland, and giving postal intercommunication with many towns of importance. His terms were—to bear himself all the cost of the service, to pay a fixed rent, and to retain the surplus. This contract was renewed and extended from time to time, so as to include other branches of road, and terminated only with his death, in 1764. Mr. Palmer (a great name in the annals of the Post-office) says the net profits of this contract to its holder amounted to 12,000*l*. a year, or, in the total, to rather more than half a million! This is the only instance of unclouded good fortune in the career of postal reformers. Eighteen years after the death of Allen appears John Palmer, proprietor and manager of the theatres of Bristol and Bath. The most obvious feature of his plans was the substitution of mail-coaches for boys on horseback, or for mail-carts, though he introduced many other improvements. He encountered much opposition, but the Minister, the younger Pitt, adopted his plans, and Mr. Palmer was employed to carry them into effect. His opponents bided their time, and two years afterwards, when his plans were yet only in partial operation, he had to encounter another struggle, and was defeated. The Minister, although he gave up the inventor, retained the invention. It had been agreed that Palmer was to have 1,500*l*. a year, and $2\frac{1}{2}$ per cent. upon all excess of revenue beyond a fixed sum. When ejected from the Post-office, not only did his salary terminate, but instead of his $2\frac{1}{2}$ per cent. he was obliged to accept a life annuity of 3,000*l*. This, even at that early date, was below the proceeds of his percentage, while the rapidly advancing revenue soon made the difference far

* Delivered before the Royal Institution.

wider. He appealed against this injustice, and eventually obtained a Parliamentary grant of 50,000*l.*; an amount, however, wholly inadequate to satisfy his claim.

To what foster-parents the young system was consigned on the loss of its father, may be gathered from certain criticisms proffered by the gentlemen of the Post-office on Palmer's proposals, even after they had had some brief and partial trial. Mr. Draper objects to mail coaches as running *too fast.* He declares that the post cannot travel with the expedition of chaises and diligences on account of business needing to be done at the Post-office in each town through which it passes — the fearful velocity which Mr. Draper deprecates rising possibly to six, or, in some cases, even to seven miles an hour. Be it remembered, however, that prior to Mr. Palmer's innovations, the average rate of the mail, including stoppages, was only three miles and a half per hour, which, in the opinion of the office, left nothing to be desired! In truth, speed appears to have been looked upon with great suspicion. Palmer had maintained that the post should outstrip all other conveyances; but the judicious Mr. Hodgson says, "I do not see why the post *should* be the swiftest conveyance. Personal conveyances, I apprehend, should be much more, and particularly with people travelling on business." Palmer found the net annual revenue of the Post-office about 150,000*l.* By the year 1814, in the face of an enhanced tariff, it had risen tenfold, namely, to 1,500,000*l.* — an augmentation chiefly attributable to the greater speed and punctuality secured by his improvements, though aided unquestionably by the national advancement in population and wealth. But thenceforward, until the epoch of Penny Postage, the impulse given to the increase of letters by the causes already pointed out, and indeed, by all others — especially by Macadam's admirable invention for bettering our roads, which enabled the mails to attain a rate, including stoppages, of ten miles an hour — proved to have become exhausted. For twenty years the number of letters passing through the Post-office remained stationary, amidst the rapid development of our manufactures and our commerce, the concentration of the national mind on the arts of peace, the consequent expansion of correspondence, and the innumerable facilities for its distribution which had been thus created and had been necessarily displayed before the slumberous eyes of the postal authorities. The augmentation of correspondence had broken through the monopoly of the Post-office, guarded although it was by high penalties, rigidly enforced. The mail coaches were outstripped by the improved stage coaches, which set the penal laws at defiance and carried an enormous number of contraband letters. But in spite of harsh laws harshly executed, of a straitened service, and of exorbitant rates, the Post-office still remained a popular and respected institution. At length, however, it discovered that it had traded too long on its reputation. Murmurs were heard among the people, and the discontented found a champion in the late Mr. Wallace, M.P. for Greenock, who frequently called the attention of the House to the preposterous rates of our postage. The desire for change grew with a steady growth.

In the year 1837 Mr. Rowland Hill, then filling the position of secretary to the Commissioners for managing the affairs of South Australia, a person scarcely known beyond the circle of his family and his friends, put forth a scheme of postal reform which, being named after its most striking feature, was called Penny Postage. He proposed the uniform rate of a penny for all letters under half an ounce, to whatever part of the United Kingdom they might be carried. Hitherto, if a letter consisted of two pieces of paper, however small, it was charged double postage. Treble letters paid treble postage; quadruple letters, and all other multiples paid according to weight, but on a scale still increasing in proportion to distance. Taking all matters into account, he struck an average, whence it appeared that by his plan the public might command for 1*d.* as much postal service as could be had on the then established rates for 9*d.* The people at large, the manufacturing and mercantile classes, the clergy — who witnessed every day the privations endured by the poor for want of a post office within their means to use — all united in loud and earnest prayers to the Legislature to confer upon them the boon which had been held up before their eyes. On the other hand, the heads of both the great parties in the State were impressed with the fiscal dangers of the proposed experiment; many believing that the project involved not merely an extinguishment of all revenue from letters, but, in addition, a ruinous subsidy to defray the expenses of the service. Not that Mr. Hill had left his plan unsupported by allegations of fact and by arguments which, in the event of the facts being sustained in proof, showed that the attractive results promised might be achieved without any ultimate diminution of the net revenue to a more serious extent than from 1,500,000*l.*, at which it then stood, to 1,200,000*l.* For a long series of years prior to 1837 the state of the Post-office had been a favourite subject of inquiry both by Royal Commissioners and Parliamentary committees, although the only very conspicuous product of these investigations was a formidable pile of blue books. To Mr. Hill, however, who had never entered a post-office in his life, these books were a mine of knowledge, enabling him to frame a set of queries, to some of which he succeeded in procuring answers. But these were neither abundant nor accurate. For instance, it was essential that he should ascertain within certain limits the number of chargeable letters passing through the British post-offices in each year. No satisfactory information on this head was the Post-office able to afford. Upon the best data within his reach, he computed the annual number at about 88½ millions; but after some time, having to a certain extent been able to correct his data, he revised his estimate, which he finally settled at 79½ millions. The Post-office estimated the number at 42 or 43 millions, then at 58 millions, next at 67 millions, and subsequently at 70 millions. But the Committee of 1838, after a most laborious and searching scrutiny, conducted with untiring zeal, and with a degree of ability which cannot be too highly appreciated, arrived at the conclusion that the real number was 77½ millions. Eventually it was admitted by the Post-office itself to amount to 76 millions, which number was finally adopted. As the scheme of Penny Postage was based on the understanding that the ultimate loss to the revenue would not exceed 300,000*l.* per annum, a tolerably accurate computation of the real number of letters was one of the problems regarding the amount of increase in correspondence required to fulfil this condition, it being self-evident that if the Post-office had been correct in its estimate of 43 millions, the required multiplication must be very much larger than if the then existing number, as was now conceded, amounted to 76 millions. The Postmaster-General contended that a twelvefold increase would be necessary, while Mr. Hill calculated that a five-fold increase would suffice. To enable the Committee to form a judgment of the sources of increase, he began by adducing evidence to prove the vast multitude of contraband letters which, if postage could be reduced to a penny, there would be no temptation to transmit through a surreptitious medium. He then proceeded to show that the number of contraband letters, great as it was, must sink into insignificance when compared with that which the high tariff prevented from being written at all. It is believed that on the institution of Penny Postage contraband transmission ceased altogether, and yet the first year added but 93 millions of letters to the 76 millions of the old system, while some portion of this 93 millions must clearly be placed to the account of letters which, but for the reduction in postage, would not have come into existence. The augmentations of subsequent years have exceeded the limits of the wildest aspirations. But Mr. Hill did not depend altogether on the effect to be produced by swelling the grand total of letters. He laid great stress on diminishing to the Post-office the expense of the service—the cost per letter, not the total expense—*that*, by the expected great increase of letters, was sure to be enhanced. This important end he proposed to attain by the combination of two expedients. One was uniformity of postage. The other the relief of the office, by the employment of stamps, from the onerous duty of collecting postage. That both these changes must be highly economical is obvious. The taxation of letters, as it was then called, meaning thereby the task of ascertaining the amount of postage for each letter, and registering it upon the letter itself, was a slow and complex process, the greater part of which uniform postage did away with. But the principal item of cost had always been the delivery of letters from house to house. Under the old system the all but universal usage was for the sender to post his letter unpaid. The inevitable consumption of time thus caused in the collection of postage would be fresh in the memory of a large portion of the audience. Neither of the two branches of postal service thus cheapened presented any obstacle to the application of the principle of uniformity; but the third, namely, the journey which the letter made from the office of reception to that of destination, would appear at first sight of necessity to demand different rates of remuneration. No one was prepared to believe that the transit of a letter from St. Martin's-le-Grand to Barnet, the first stage on the road to Edinburgh, would cost practically the same as the whole journey, and yet Mr. Hill found, on laborious investigation, that such was the fact — the sum for the whole journey only amounting to one-ninth of a farthing! Thus, it is clear that strict justice, to say nothing of convenience to the Post-office, which means economy, is more closely approached by making no variation of charge in respect of greater or smaller distances of conveyance than could be attained by acting on any differential scale imaginable, unless, indeed, we had a coinage descending far below farthings. By the result of this investigation, which I think I am justified in calling a discovery, all objections to adopting the principle of uniformity were fully answered, and Mr. Hill's case was complete. The Committee reported in his favour; the project was embodied in a Bill; passed the Legislature the next session, and, at the commencement of the year 1840, was carried into operation.

And here time warns me to break off my narrative. I will conclude with a brief comparison of postal affairs as they stood at the publication of Mr. Rowland Hill's plan, with their present state; premising that the results which I have now to exhibit could not have been obtained without hearty and intelligent co-operation on the part of many gentlemen in the Post-office, who in the discharge of their respective duties have laboured with fidelity and devotion to promote the new system to the best of their ability. I cannot bring myself to pass their exertions by in utter silence, although I have no space for a more explicit notification of their services. As late as the year 1838, of the 2,100 districts of the registrars of births, deaths, and marriages in England and Wales, about 400, then containing 1,500,000 inhabitants, were destitute of a single post-office. The average extent of each district was nearly 20 square miles. Several of these postal deserts were considerably larger than the county of Middlesex! The average population of the chief place of each district was 1,400, and its average distance from the nearest post-office between four and five miles. Yet the ramifications of our postal system pervaded England far more thoroughly than they did the remaining divisions of the United Kingdom. Many other English and Welsh districts, though possessing post-offices, were yet so scantily supplied with them in proportion to their area, that in all probability 4,000,000 of the population of England and Wales, amounting at that date to one-quarter of the whole, must be held to have been destitute of postal accommodation. The great extent of the deficiency might be also gathered from the single fact that, while England and Wales contain about 11,000 parishes, the total number of their post-offices of all descriptions was only 3,000. At the present day the comparison stands thus:—The number in England and Wales has increased to 11,000, making it scarcely possible that any one of the registrars'

districts should now remain unsupplied with a post-office. The offices in Scotland and Ireland have also received considerable augmentation, the number in the United Kingdom having risen from 4,518 to 14,358. In 1838 Mr. Hill suggested the institution of day mails, to facilitate the despatch of letters. Now a mail by day as well as by night is despatched to most of the towns in England and Ireland. A large number have the advantage of two day mails, and some have even three or more. In the metropolis, under the old system, there were but six deliveries *per diem*. There are now eleven. Several of the suburban districts have six deliveries a day. The measure which rendered these improvements practicable was the division of the metropolis into ten postal districts. It came into partial operation in 1856, and is now almost complete. Each of these districts is treated as a separate post town. This arrangement has been followed by a vast and rapid increase of letters posted and delivered within the London district. During the five years preceding 1856, the average annual advance in the number of metropolitan letters was only 3¾ per cent. By 1858 it had risen to 12 per cent. These letters far exceed the total number from all sources—home or foreign—delivered throughout the whole island of Great Britain (London included) in 1839. They amount to 68 millions, being only 8 millions less than the grand total of the United Kingdom for that year. Subdividing London has also effected a considerable acceleration in the first delivery of each day. Postage to and from the colonies and foreign parts has been much lowered, while the transit has been greatly quickened. In 1839 the number of newspapers delivered in the United Kingdom was about 44½ millions. At that date every copy, by law, bore a stamp, which, however, had the advantage of franking it when sent by post. This privilege furnished a strong motive to proprietors and newsmen to distribute their impressions through that channel; whereas at present, if copies are sent by any other means than through the post, no expense is incurred in stamps. Nevertheless, the number despatched through the Post-office last year reached 72½ millions.

The privilege of sending books and works of art by post at a reasonable charge is one of Mr. Hill's improvements. Medicines, watches, patterns, botanical specimens, seeds, and many other articles now pass largely through the office, to the convenience of all, but more especially of residents in the country: for it is not undervaluing the great benefits we have derived from the multiplication of railways to remark that they do not, and probably never can without the aid of the Post-office, distribute parcels even to all our towns, much less to our villages and single houses; whereas the proportion of letters and other posted packets delivered by the letter-carriers at the houses of those to whom they are addressed is now probably not less than 95 per cent. of the total number despatched. Of late years the rapid development of the book-post, which dates from 1848, has been remarkable. In 1854 the number of such packets was only 750,000, yet last year it had swollen to twelve millions.

An important branch of the service, largely developed since the institution of Penny Postage, is the system of money-orders. In 1839, the total number issued for the United Kingdom was 188,921, and the amount of money 313,124*l.* In 1861, the number reached 7,580,455, and the amount was 14,616,348*l.* And during that interval, although the price of money-orders has been reduced to one-half, the growth of the system has been accompanied by a change most advantageous to the department. In the first years the service entailed a loss, which for 1847 amounted to 10,000*l.* In 1860, it brought a profit of 28,000*l.* Intercommunication of every kind told upon the increase of letters, and, no doubt, the last addition to the benefits conferred by the Post-office, namely, its Savings-banks, now rapidly spreading over the land, will be followed by similar consequences.

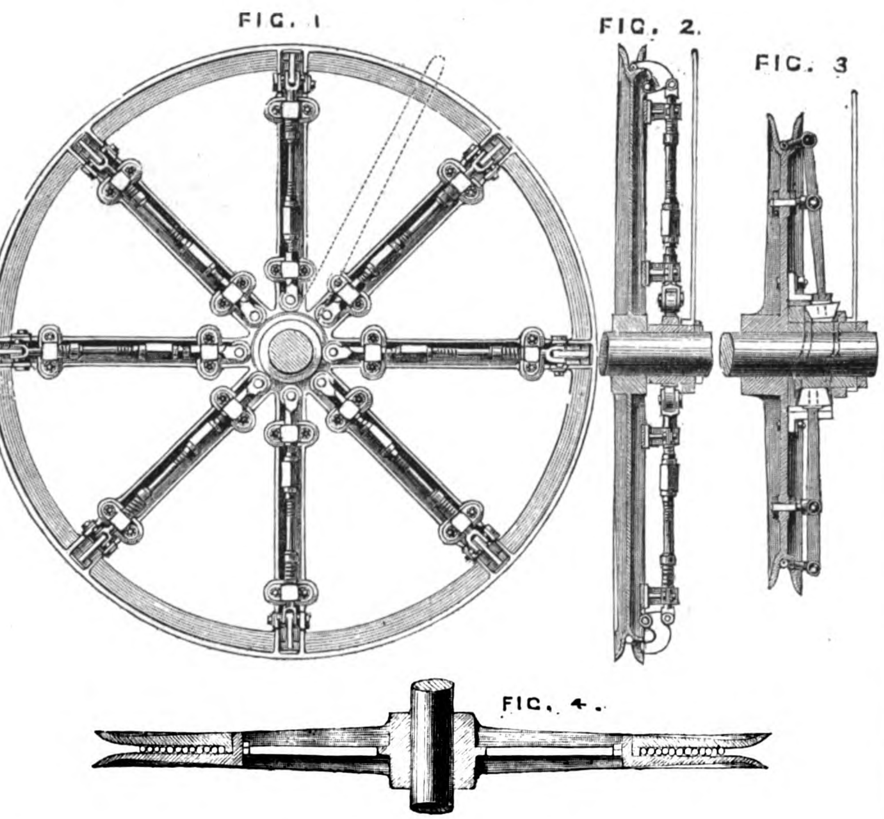
From the various causes thus co-operating to the increase of letters, I pass to effects. The number of chargeable letters delivered from the British offices in the last complete year before the reduction of postage was, as I have said, taken at 76 millions. The number in 1861 had risen to the stupendous amount of 593 millions, being nearly an eightfold multiplication of the former number. Let us study the proportion of letters to population at the two extremes. In 1839 it stood thus:—In England and Wales four letters per annum to each individual, in Ireland one, in Scotland three, being an average of three to each person in the United Kingdom. In 1861 it had grown in England and Wales to twenty-four per head, in Ireland to nine, in Scotland to nineteen, being an average of twenty per head for the United Kingdom. This enormous increase might be placed in still another light. The total weight of letters, exclusive of newspapers and other matter, during the year 1839, was 758 tons. In 1861 it had risen to 4,300 tons. The increase of the average daily mileage of the mails is very striking. It was estimated that in 1839 it did not exceed 54,000 miles per diem, whereas, in 1861, it had risen to 149,000, being six times the circumference of the globe. The staff of officers of all ranks and both sexes constantly employed in the labours of the Post-office was, in 1839, by rough estimate, about 8,000. In 1861 it was, by exact enumeration, 25,473. In addition to this force, many persons are engaged for a portion of their time. The gross revenue in 1838 was 2,346,278*l.*; in 1861, upwards of three millions and a half. Hence it appears that, notwithstanding the wonderful reduction, whereby the public now obtains far more of the article postage, for the same price, than it did formerly, yet that its expenditure in postage exceeds by more than one-half the amount so spent under the old exorbitant rates. The net revenue for the last year exceeds 1,500,000*l.*, so that, as regards both gross and net revenue, the facts have gone beyond Mr. Hill's original estimate. Nor is the promise for the future less brilliant than the experience of the past. Correspondence is still advancing by rapid strides. One feature in this vast accession cannot but give rise to sanguine expectations. Whatever the vicissitudes in our harvests — whatever the fluctuations of our commerce — whether we are in the enjoyment of peace or suffer the privations of war — each revolving year adds to the mass of our correspondence. The tide of our letters, like that from the Pontic to the Propontic Sea, knows no ebb. 1861, though by no means a year of unclouded prosperity, added an influx of twenty-nine millions — an addition even beyond the average of former years. Such, then, is the success of Penny Postage, and such are its prospects. Still, though no peril can be discerned, the instinctive feelings of mankind and the teachings of history warn us always to be prepared, if not for reverses, yet for some interruption in this course of unexampled prosperity. That, should checks occur, they will be transient and casual, we may reasonably expect, since correspondence does not flourish or fade with the changes of manners or fashions. Its growth is governed by causes not peculiar to any one country, but common to all. This is demonstrated by the rapid spread of the new system throughout the civilised world. One source of danger is dried up. The Post-office no longer assumes to be perfect, and its conductors have renounced their claims to infallibility. Suggested improvements, if they sustain the necessary test of rigid scrutiny, are welcomed, and not, as of old, frowned away. The department acts under the conviction that to thrive it must keep ahead of rivals — that it must discard the confidence heretofore placed in legal prohibitions, and seek continuance of success only by deserving it.

The iron trade continues much in the same state as last week. There are some orders in the district from America. Plates of small dimensions and sheets are in fair request, but for angle iron and rounds the demand is not at all brisk. Good samples of pig iron are fetching better prices than they were, but the rates are far from being remunerative. The demand for large coal still rules dull, but the price, with some few exceptions, remains unaltered. Lumps and fine slack form an exception. Ironstone, the produce of the district, has an upward tendency, and labour is more in request.

ART IN COPPER.—The malleable quality of copper and its adaptability to the purposes of art have seldom been more fully demonstrated than by Mr. Thomas Phillips, of Snow Hill, in a work of very high merit, of which the spirited design is only equalled by the ambition displayed in its execution. Of all forms of animal life, none have presented more difficulties, and none have been attempted with less success by workers in stone or metal, than the forms and attitudes of birds, whether in a state of motion or repose. This defect, due to the materials used, more than to the deficiencies of the artist, has been boldly grappled with, and successfully overcome by Mr. T. Phillips, senior. His figure of a "golden eagle" is the first attempt made to render feather for feather in either metal or stone. The eagle, which is of the natural size, stands on the summit of a rugged and precipitous rock, in a bold and threatening attitude. With wings outspread ready for a dash at his quarry, or to withstand a human foe, the bird, with one claw advanced, firmly grasps with his talons the rocky ledge, while, with head protruding, and open beak, he absolutely seems to scream warning and defiance. The keen eye peering from under the shadowing ridge of the skull, the rising feathers of the crest, the swell and ruffling of the muscular neck, form a picture of savage anger as true to nature as it is admirably conceived and executed. The whole figure is instinct with life, and has more the appearance of a real bird electrotyped by some miracle than aught else to which it can be compared. Every one of the minute feathers which cluster round the neck, the fine hair-like down which runs from the beak to the eye, the soft cushion of plumage at the junction of the wings and body, are here separate, and can be each separately raised by the finger. The half hairy, half feathery legs of the bird are wonderful in the fineness of the down which overspreads them. The most extraordinary triumph of Mr. Phillips's skill, however, is shown in the extremely minute feathers which cover the frame of the pinions and which conceal the fastenings of the large feathers forming the tips of the wings. It would be impossible to overrate this portion of the work, so numerous and so thick are the feathers, and so soft and deep is the effect produced. The rock which forms the eagle's eyrie, a fine mass of tin and antimony in combination, is of bold workmanship, and forms a pleasing contrast to the somewhat dusky colour of the plumage. Nothing can be more happy than the colouring of the figure of the bird. The metallic lustre of feathers, so difficult to imitate in painting, is here rendered with great felicity. Equally good also is the horn-like appearance given to the beak and talons, while the yellow and wrinkled scales of the feet are life-like. The mode of colouring which Mr. Phillips has employed is a secret of his own, and was discovered by him in the course of executing this figure. It is an improvement on the old system, inasmuch as it supersedes the aid of a battery by a new process of what may be called cold electrotyping. Its chief advantage over the ordinary method consists in the variety of colouring on the same surface which it allows, and its superior economy. For six years Mr. Phillips has been employed in bringing this work of art to its present condition. More than 10,000 feathers, formed from ordinary copper-plate, all made by hand, some of which had to pass twenty-six or twenty-seven times under the hammer and graver, were necessary for the plumage alone, and show the unwearied patience and industry employed on what has evidently been a labour of love. Mr. Phillips, we understand, proposes shortly to allow the public to judge of its merits.—*Times*.

At a recent meeting of the Austrian Society of Engineers, Mons. Bender, Chief Inspector, gave an account of an apparatus invented by Mons. Schan, to prevent incrustations in boilers. It consists of a closed cylinder placed high up, and attached to the boiler by a short pipe. In this cylinder the feed-water is sprayed by a rosette, which reduces it to minute drops, so that the steam instantly heats it to the boiling point, before it reaches the boiler. This increase of temperature precipitates the solid matters which are deposited in the cylinder. The advantages of this have been established by experiments on a large scale: a locomotive fitted with this apparatus has run 5,500 miles in several trips; it has deposited 267lbs.=0·014 of matter, soft like soap, while the boiler remained clean. The result was the more remarkable, because at the beginning of the experiment it was covered with a solid crust 5-16 in. thick, which had completely disappeared during the travels. Mons. Egerth, who presided, observed that when the feed-water was returned to the tender after being much heated, it caused considerable deposit, while the boiler remained nearly clean.

BURROWS AND DOUGAN'S PATENT WINDING DRUMS.



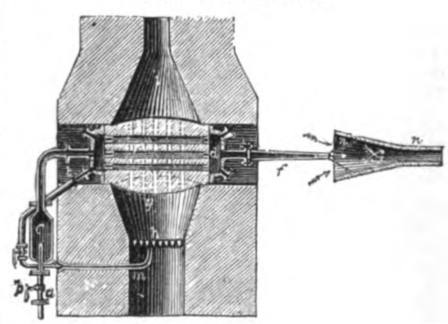
Messrs. Burrows, of Wigan, and Joseph Dougan, of Haigh, Lancashire, engineers, have recently patented an invention for improvements in winding or driving drums or pulleys. The first part of this invention consists in the application of power or pressure to some part or parts of the rope, band, or chain during the time in which such parts or portions of the rope remain in contact with the drum or pulley, by which means an increased amount of adhesion is obtained, and a correspondingly greater power for driving machinery, drawing or lifting weights, and similar purposes. At a number of points in the circumference of the winding drum, or driving drum, or pulley, we attach clips or holding pieces, which are caused to press upon the rope, band, or chain whilst it is in contact with the pulley, and to force it against the sides or bottom of the groove in the pulley. The clips turn upon centres so as to be withdrawn from the rope or chain at or near the point at which it leaves the drum or pulley, and are attached to or acted upon by rods radiating from the centre of the pulley, and having antifriction rollers at their inner extremities, which are in contact with the circumference of a cam placed on the drum shaft, a portion of which cam corresponding to the portion of the pulley which is in contact with the rope, is formed to a greater radius than the rest, so that (the cam being held from revolving with the pulley) as each antifriction roller arrives at the raised portion of the cam, the rod to which it is attached is forced outwards, and acting upon the clip causes it to press upon the rope as long as the roller continues to run on the raised portion of the cam, being released by a small spring or other suitable apparatus, when the roller is clear of the raised part of the cam; or the clips may be attached to the outer extremities of levers radiating from the centre of the pulley, and having antifraction rollers at their inner ends acted upon by a suitable cam, for the purpose of closing the holding pieces on to the rope at the proper time, and by a corresponding cam reversed for the purpose of releasing the clips.

The second part of this invention applies to winding drums or pulleys for round ropes in particular, employed for winding coals, &c., from mines or other similar purposes, and is designed more especially for the purpose of compensating in a higher degree than has been usual hitherto with round ropes for the extreme weight of the rope or ropes, thereby diminishing the extreme load or pressure upon the engine, or otherwise enabling the same engine to do more duty with the same pressure or their equivalents. This improvement consists in arranging the sides or plains of winding drums, sheaves, or pulleys parallel as near as may be to each other, leaving a width or space between the insides of the planes of each drum, sheave, or pulley equal to or only a little in excess of the diameter of the rope to be used, so that when the rope is attached to the drum and the drum is caused to rotate, each consecutive coil will be laid or wound upon the preceding coil, and so on in succession, instead of as is usual coiling upon a drum side by side, or to the extent of a few laps only in depth. By this arrangement the practical diameter or leverage of the drum is increased as the rope is wound on, thus wholly or partially equalising the power required for raising such length of rope and load throughout the process of winding.

DAGUZAN'S IMPROVED METHOD OF PAVING ROADS.

Monsieur V. L. Daguzan, of Paris, proposes to pave roadways in the manner shown above, which consists in the superposition of two roads or ways, one underneath composed of trenches or gutters made of beton, and covered with bitumen, or other water-resisting composition, serving to conduct the water and detritus into the drains, and sufficiently strong to support the upper way for the circulation of horses, carriages, and foot passengers. The upper road or way is composed of slabs or flags placed horizontally side by side, with spaces left at certain distances between them for the passage through them of water, detritus, and other matters into the drains. These slabs or flags may be of granite, or other stone or substance sufficiently strong and suitable for the purpose. Slabs made of cast-iron are preferred, having cellular openings or spaces, in which are applied and fixed by bitumen or other suitable substance, blocks of sandstone, porphyry, granite, or wood, impregnated or not with preservative substances. The distance between the two ways may vary: thus, the upper road or way may be close to and be supported on parts of the lower road or way, provided with canals or conduits for running off the waters, detritus, and other matters driven into the drains by flushing or by cleaning tools; or the distance between the two roads or ways may be several yards, in which case the slabs or flags forming the upper way are supported by walls, posts, columns, arcades, vaults, or other suitable supports, so that the cleaning may be easily effected, and at convenient times underneath the upper way. With this latter construction drains may be placed in the centre of the lower road or way, which will render the cleaning easy, and permit of placing under the upper way water and gas pipes, and telegraphic wires, which may be placed between the two ways, so that their keeping in order and repairing may be performed without stopping the circulation, or very rarely.

BROOMAN'S IMPROVEMENTS IN SUPER-HEATING STEAM.



The accompanying engraving illustrates, in vertical section, a furnace and vessel for superheating steam, which vessel the inventor, M. Testud de Beauregard, of Paris, terms an "Aërhydric Blower."

The invention relates to the generation and employment of dry and superheated steam at a temperature of about 390° Fahrenheit, or of a gas fixed or not, the pressure of which shall be equal to what may be necessary for the particular application for which it is to be used. This steam or gas is caused to escape from an orifice by virtue of its compression into another orifice, calculated according to the quantity of air required in a given time. The mixture of steam or gas and air is projected upon ignited combustible matter. There is then produced the phenomenon of double decomposition; the air yields its oxygen to the combustible matter to assist its combustion, and the steam already divided will become decomposed into oxygen and hydrogen, so as to produce the highest combustion. This blower is applicable to various industrial uses.

1st. It is an advantageous and economical substitute for the blowers for forge fires, blast furnaces, and other uses as at present made.

2nd. When used with steam generators, fire bars may be dispensed with; no smoke will issue and a great development of caloric will result.

3rd. For locomotives the blower acts either for drawing in air, and allows of a measurable quantity according to requirement or as a supply of combustible; the steam transformed into hydrogen and oxygen aids as an economical and powerful caloric agent.

4th. By its employment pure and carburetted hydrogen gas may be obtained, which may be used as a heating or as a reducing agent.

This method of superheating steam or gases to a high temperature may be employed in the reduction of metals, in the desulphuration of ores and coke, in the firing of china and earthenwares and glass, in the baking of bricks and plaster, and in the burning of lime, in carbonisation, distillation, and otherwise.

a is a pipe provided with a tap *b* for conveying the superheated steam or gas into a chamber *c*, where the steam is dried or deprived of its watery portion. The steam leaves the chamber *c* for the superheater, which is made of cast iron or fire clay, and consists of a superheating vessel *d* placed in and across a furnace; horizontal steam tubes *e, e*, are placed in this vessel through which the steam circulates, is superheated, and escapes by the pipe *f*. *g, g*, are vertical tubes, indicated by dotted lines in the superheater to allow of the gases and products of combustion passing through them from the grate *a* to the chimney *i*; *l* is a pipe, one end of which is in connection with the superheating vessel *d*, and the other with a passage *m*, whereby steam is led under the grate before or after being superheated, to act as a blower to the furnace and superheater. Steam to be superheated enters through the pipe *a*, furnished with the cock *b*, into the drying chamber *c*, from which a pipe conducts it into the superheating vessel *d*, in traversing the horizontal tubes *e, e*, in which it becomes superheated; it issues from the superheating vessel into an outlet pipe *f*, the nozzle of which enters a tube *n*, in the side of a blast furnace or kiln, the mouth of which is funnel-shaped. The section of the outlet pipe *f* is calculated according to the quantity required in a unit of time; its nozzle should be removed so much farther from the mouth of the funnel-shaped tube *n* as the pressure is to be increased. The mouth of the funnel is also calculated according to the quantity of air to be introduced concurrently with the steam or gas in the same unit of time. The smallest opening is a section which will allow of the addition of the quantities of air and of steam or gas which are to be projected under the pressure necessary to the combustion to be obtained. There are cups in the superheating vessel containing metals or alloys of different degrees of fusibility, which answer as pyrometers, and are for the purpose of enabling the person in charge to regulate the fire. A pipe furnished with a cock is carried from the superheating vessel and enters another, the outlet from which is under the fire bars. Thus a blower is provided to the apparatus itself.

NEW MODE OF MAP ENGRAVING.

At a recent meeting of the Franklin Institute, Philadelphia, Samuel Sartain, Esq., engraver, of that city, exhibited an impression of a large map, devised and executed on a new and effective plan by Col. Baron Egloffstein, U.S.A. It illustrates the labours of the U. S. expedition for exploring the *Colorado River of the West* and surrounding country in New Mexico.

Baron Egloffstein, the topographer of the expedition, conceived the idea of endeavouring to give his map the appearance of a small plaster model of the country; and to do this he treats the forms of nature as an artist would draw any form before him — that is, by giving the real light and shade that would be developed by light falling on the model at a suitable angle. The mountains have their shadow-side engraved in the usual manner by "*hachures*," but the light-side is only slightly tinted in parts to develop detail of form, and is brilliantly relieved by a tint spreading over the level plain like an Indian-ink wash; this tint is made of several grades of strength, intended to show the *relative altitude* of the several plateaus over which it is spread, the lowest or alluvial lands having the darkest tint, and the loftiest table-lands having the most delicate.

The result in the present map is bold and striking, showing at a glance the nature of the whole country, enabling anyone to perceive the character, prominence, and relation of the different parts. This region of country has features unsurpassed in their kind for grandeur and sublimity; the Colorado of the West flows for 300 miles of its course through Cañons whose sides often rise perpendicularly from 3,000 to 6,000 feet in height; the "Great Cañon of the Colorado" is the most magnificent gorge as well as the grandest geological section of which we have any knowledge. For this reason Colonel Egloffstein's system of mapping has unquestionable advantages; its freedom from conventionality and its truth to nature give it a power, unattainable by the old system, of representing forms so that they are intelligible to every eye.

The French at one time used a system of topography similar to this; it had light-sides and shade-sides to the mountains, but they did not tint the level plain, on which so much of the character and beauty of this style depends. The tint on the steel plate shown is machine-ruled (nearly 200 lines to the inch), and graded to the requisite strength by acids, giving by its fineness the appearance of delicate India-ink tints: this portion of the work was executed by Mr. Samuel Sartain, and excels as a specimen of this method of engraving.

Colonel Egloffstein deserves the thanks of the *public* for enabling them to read some of the results of scientific labours with an *ease* that was before only possible to the professional topographer, and at perhaps less expense than by the old system.

OVERWORKED RAILWAY ENGINE-DRIVERS.

On Tuesday last, in the House of Commons, Mr. Cobbett called attention to the petition of engine-drivers and firemen, working on several lines of railway, complaining of the excessive number of the hours during which they worked continually, also to other petitions on the same subject, and moved "That a committee be appointed to enquire into the matter of the said petitions." He said that the grievance complained of affected a large body of working men, and also the public. Some eighteen months ago he was applied to by a number of engine-drivers and firemen on the Great Western, the Lancashire and Yorkshire, and four or five other railways, to bring their case before Parliament. They represented that they were kept at work for so many hours continuously that their health was injured, and the lives of passengers placed in jeopardy. The averages of their hours on certain railways were respectively 14, 16½, 15, 16, 14, and 15 in the 24 hours. The greatest number of hours at which men worked consecutively were 20, 25, 23, 23, 26, 28, and 24, on different railways respectively. The petition of the engine-drivers and firemen was signed by 700 men. The body consisted of many thousands, who were respectable, and had great influence. Those who complained said that their hours were unnecessarily long, and, with proper management, might be shortened. It was only on seven lines of railway that complaints were made. On others, including the Great Northern, there was no such grievance. When first applied to he recommended these men to appeal to their directors, and then to the Board of Trade. They had done so, and had failed to obtain redress, and therefore he brought the subject before the House. In one of the many cases which had been laid before him, a man had worked as many as fifty-six hours in three days — pretty nearly fifty-six consecutive hours — and in another case a man who had worked nineteen and three quarter hours was obliged to resume duty after a rest of two and a quarter hours. An article in the *Quarterly Review* traced a collision on one of the Scotch lines to the exhaustion from over work of the men in charge of a train. One man had told him that he frequently slept for miles on his engine, and when he awoke he could tell where he was only from some peculiarity in some posts by the side of the line. Such things placed the public, when travelling by railway, in considerable peril. In addition to the petition of the engine-drivers and firemen, he had presented thirteen petitions from the inhabitants of towns on the railways in question, signed by mayors, town-councillors, magistrates, clergymen, and merchants, who stated that they knew that the engine-drivers on the lines on which they travelled were overworked, and that their own lives were jeopardised. They therefore prayed the House to pass some measure upon the subject. He now made his motion as a matter of form; and if a committee were not granted, owing to the lateness of the session, and no other result followed, he would, in a future session, do something more than merely call attention to the subject.

Mr. Gibson said that it was true that a deputation of engine-drivers had attended at the Board of Trade, representing that they were suffering under a system of very long hours of labour. It did not appear, however, that the whole body, as a class, agreed to the necessity of Parliamentary interference between themselves and their employers. They admitted that those who were moving in this matter formed only a small portion of the engine-drivers. No doubt there were particular cases of persons working long hours; and, if such a practice were general upon the railways of the United Kingdom, the engine-drivers would be unable to exercise the vigilance necessary for the safety of the public. But, as a matter of fact, he was informed by the inspectors of the Board of Trade that accidents had very rarely occurred through the long hours of work by the engine-drivers. Besides, it appeared to him that it would be altogether a new principle to interfere in such a case. Parliament had protected women, children, and young persons in factories; but it had never yet regulated the labours of adult men. It would be much wiser to leave the engine-drivers to settle their own affairs with their masters, than for the Legislature to take them under its special protection, especially as they were a most intelligent class of persons, quite capable of taking care of themselves. Theirs was highly skilled labour; they were paid extra for extra hours; and it was of their own will if they worked long hours. Under these circumstances he hoped his hon. friend would allow the matter to rest where it was.

Mr. Hadfield asked for the names of the railways which were stated to overwork their engine-drivers. Mr. Cobbett replied the Blythe and Tyne, the Lancashire and Yorkshire, the London and North Western, Sheffield and Lincolnshire, Midland, and South Yorkshire. The motion was then withdrawn.

An important undertaking in connection with India is announced in the "Oriental Canal and Irrigation Company." The general objects are the construction and maintenance of various works of water transit, in order to improve the navigation of rivers, and to adapt them to irrigation and other profitable purposes. But the particular work proposed to be immediately undertaken is the construction of a navigable canal to connect the Indus at Jerruck with Kurrachee. This will save about eighty miles in distance, much expense, and a great deal of time in the conveyance of goods between Scinde and Kurrachee; it will further irrigate and fertilise an immense district suited to the production of the best cotton, as well as sugar and indigo; and lastly, it will be the means of supplying the entire community of Kurrachee with fresh water. All are sources of profit. These and other works will be complete in themselves, and thus each successive undertaking will add to the usefulness of the Company. The first capital is to be 250,000*l.* in 10*l.* shares, but it is ultimately intended to increase it to 500,000*l.* The chairman of the company is Colonel Grimes, and the consulting engineer, Colonel J. F. Smith, late of the Madras Engineers.

WALKER'S PATENT FLOATING BATTERY.

FIG. 2.

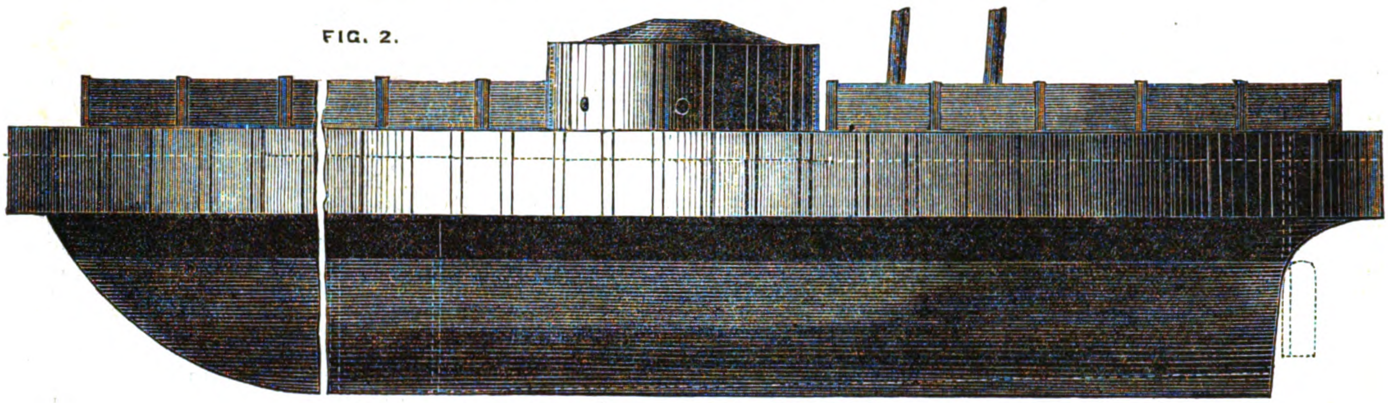


FIG. 1.

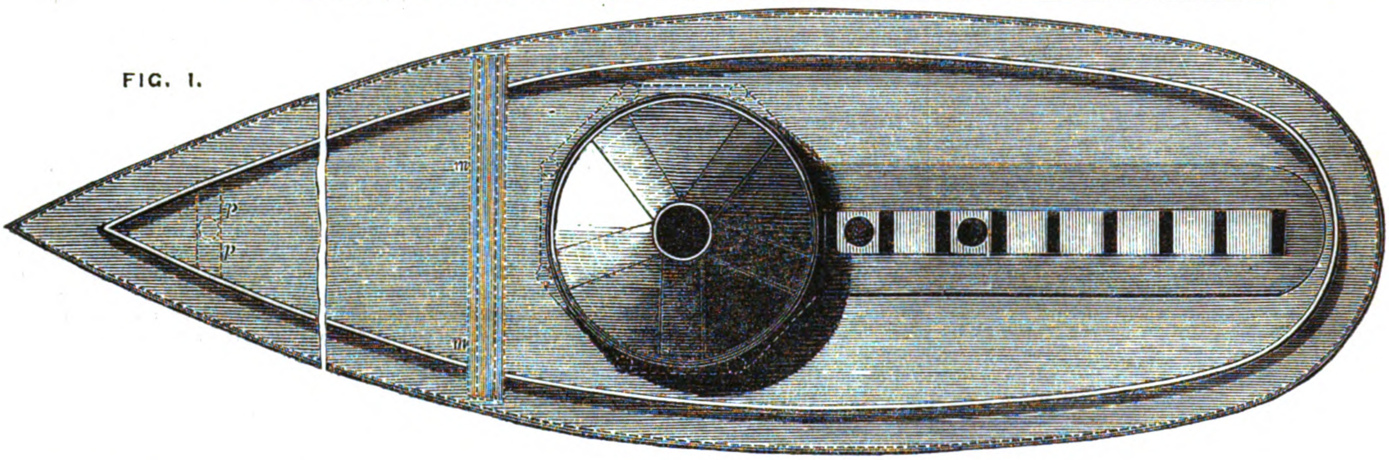


FIG. 3.

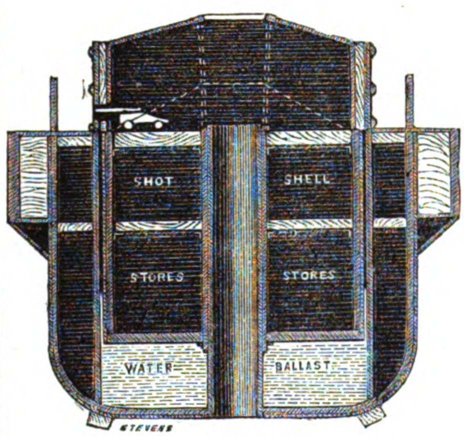


Fig. 5.

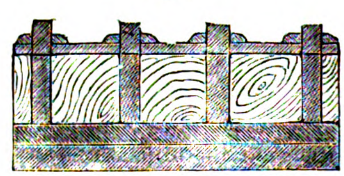


FIG. 6

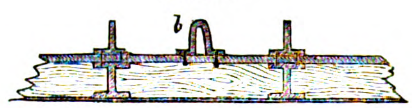


FIG. 7

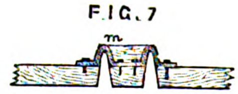
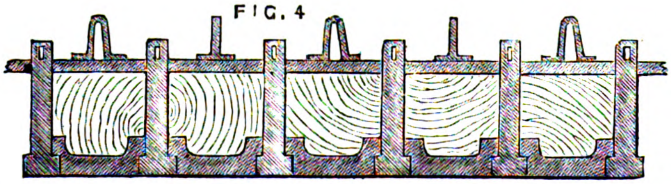


FIG. 4



[TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR, — I have sent you a few plain sketches of a floating battery which I proposed to Lord Palmerston ten months ago. Nearly all our principal rivers have no protection whatever. Neither Glasgow nor Liverpool has anything in the shape of security from being shelled, should any hostile vessel think it desirable to do so. Fixed forts, no doubt, are very well, if you could only get those obstinate people with their ships, who mean mischief, to come near enough to be shot at; but steam has altered the whole aspect of attack and defence, and therefore we must have a number of forts that can be concentrated in a few hours to meet them at any point wherever they may come or go.

Fig. 1 shows the deck of a floating battery with tower arranged for five guns: this size is intended for great speed as well as great shot power; for protecting harbours on rivers the same kind of vessel is arranged for ten or twelve guns. As the tower is turned round, each gun may be brought to bear rapidly on the same point of any vessel trying to pass; to have to reload and fire the same gun, the enemy would be out of reach. Shot, to be really effective on plated vessels, must be point blank, and if ten shots can be made to hit the same place, it will be more effective still: in this way two good things are gained, while the tower guns are striking one point, it is turning a new face to the enemy. The dotted lines P P show the mode of keeping the head of the vessel at right angles to any enemy that may approach, and can be worked by man or steam power; it also enables a vessel to be manœuvred when at anchor. *m m* shows the mode of covering the deck and top of tower shot-proof, and at the same time giving ample ventilation.

Fig. 2 shows the elevation of the same vessel with armour plates, bulwarks, tower, &c. S is a shot-proof passage from wheel to tower.

Fig. 3 shows a section of the same vessel with tower placed in water for the purpose of raising or lowering as the gunner may require, which also enables the man to turn it easily round. The defence part of this vessel is entirely outside, to give stability when firing, and is 4 feet below the water line, and 3 feet above the surface of the deck. The standards for bulwarks drop into the bridge irons, *b*, riveted inside of the skin, so that the whole can be cleared away in a few minutes. A 5 feet opening, *e e*, is left on each side of the tower and side of the ship for a passage to and fro.

Figs. 4 and 5 show the form and mode of fastening the armour plates. The great object of this plan is to make the joints the strongest part of the plate. The plates being narrow, the middle can be easily strengthened and made secure, and, being all exactly alike, they can be easily repaired.

Fig. 6 shows the mode of covering the iron hull with timber and coppering it in the usual way; 4-inch double tee irons are riveted all round the bottom to the single tee irons inside of vessel; at

the top of every other double tee iron the flange is cut away 9 inches down and close to the web; then by shaping pieces of timber to a mould, they are put in at this opening and driven down till the whole space is covered. In this way the vessel is strengthened without bolts; felt may then be put on and coppered over. There are several other points of considerable value which could be mentioned, but I am afraid that even this will take up too much of your valuable space; but still, anything that will give us greater security than fixed forts, I am sure will claim your kind attention.

J. Walker.

25 City Road.

THOMPSON AND MAWSON'S RAILWAY APPARATUS FOR COMMUNICATING BETWEEN GUARD AND DRIVER.

Provisional protection has just been granted to Messrs. Thompson and Mawson, of Bolton-le-Moors, for "Improvements in railway apparatuses for communicating between guard and driver, and for coupling and uncoupling the carriages, parts of which apparatuses are applicable to connecting pipes and tubes," which they describe as follows:

Our invention for improvements in apparatuses for communicating between guard and driver consists of the arrangements hereafter described. We carry a pipe or tube through every carriage, and form the connections between every two carriages by means of two trumpet-mouthed tubes pressed into contact with each other by means of coiled or other springs, and free to recede within the tubes in the carriages for a certain distance; or we form our connection by means of a flexible pipe, by preference of indiarubber; one end of the pipe is fixed to the end of the tube running through the carriage, while the other end is fixed to a bell or other shaped mouth, the lips or edges of which have connected to them guide-rods free to slide in and out of the carriage, and kept extended by coiled or other suitable springs. This flexible spring-pipe coupling is applicable to pipes for conveying liquids and fluids generally.

When required to increase the intensity of the sound produced by the guard in communicating through the tube with the driver, or *vice versâ*, we place a valve near the mouthpiece, and in front of that valve introduce a bell-mouthed curved tube, open outside the carriage for the purpose of catching the wind, and of driving forward the sound made after the valve is opened.

For coupling carriages, our invention consists of two fixed hooks and of two movable ones. One fixed hook and one movable hook are fitted to each carriage, to a boss placed on the end of a bar capable of being protruded from and drawn towards the carriage. The movable hooks are pinned to the bosses on the bars, and have springs fitted to them, to cause them to assume constantly a position parallel to the rails; to each of the bosses a lever is fitted, and also a weight. The coupling is effected by the carriages being brought together, when the spring-hooks will become engaged in the fixed hooks. To uncouple, turn the boss by means of the lever, when two of the hooks on one boss will be turned and freed from one another; a weight is employed for bringing back the hooks into position, when the lever is let go.

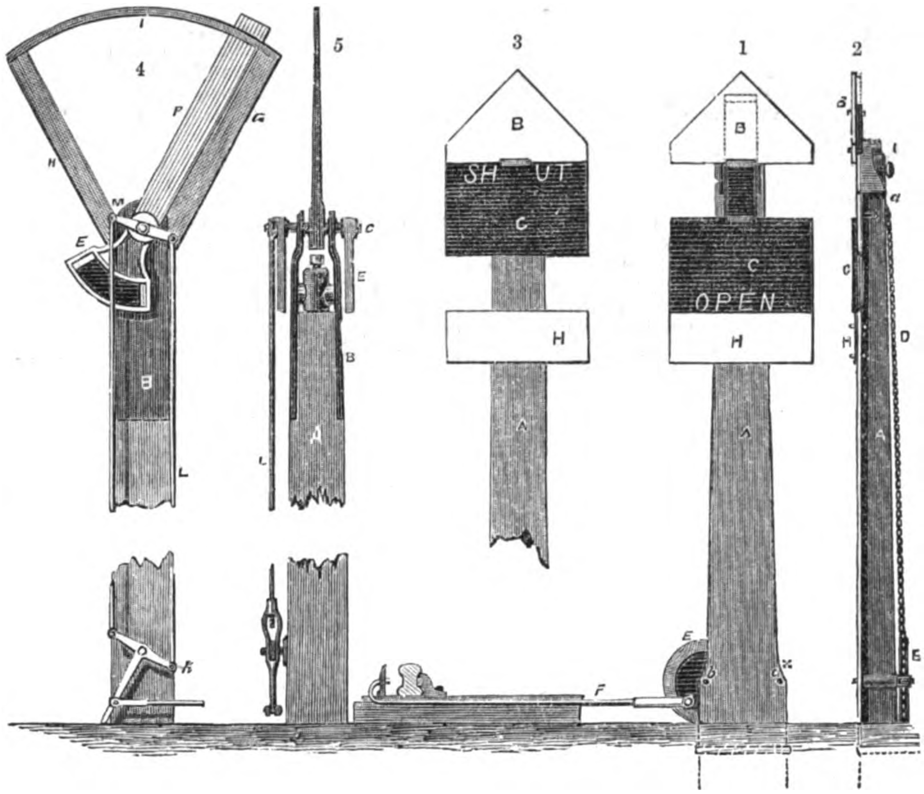
Another of our coupling apparatuses consists of an adjustable anchor-headed hook connected to each of the carriages to be coupled. First, a bar, with screw or other means of shortening and lengthening the coupling, is fitted to the carriage; the bar terminates at its outer end in a bow. Through the ends of the bow a spindle is passed; this spindle carries a roller or drum, to which a bar carrying an anchor or double hook is fastened; arms extend towards the centre of the bow from the roller, and carry a cross head through a collar, in which an upright rod is passed; on the bottom of this rod is a weight, free to be moved up and down by means of a nut. The weight forms a counterpoise to the hook and hook-bar, and, by raising or lowering the weight, the inclination of the hook and bar is regulated, and this for the purpose of suiting carriages of different heights. A lever handle is connected to the weight rods. Coupling is effected upon the carriages being brought together by one anchor hook, the heads of which are conical, sliding over and becoming engaged in the other. The uncoupling is effected by one of the hooks being turned laterally through the lever handle.

Another of our coupling apparatuses consists of two hooks movable upon a centre. One hook is connected to the end of one coupling bar, and a corresponding hook to the other. When the hooks come in contact, the ends play, give way, and the hooks pass each other; springs draw them into the former position, and the hooks, meeting in the contrary direction, become engaged.

NEW IRON-PLATED FEDERALIST SHIPS.

The last accounts which have come to hand from New York state that the twelve new iron-clad vessels which have recently been ordered to be constructed, are to be of a more formidable character than any now afloat in any country. Captain Ericsson has contracted with the Government to build six new Monitors. The plan will be the same as of that vessel, but some new ones will be about 300 feet in length, while the Monitor is only 170 feet long. Each will be 1805 tons burden, 1450 tons displacement, and 11 feet draught. They will be armed with two 15-inch guns. Several deficiencies in the Monitor will be rectified in these batteries—the pilot-house being placed on the revolving turret, and ventilations passing the roof of the latter instead of through the deck. The turrets are to be 21 feet in diameter, and 11 inches thick. The speed is to be ten miles an hour. Four of these vessels are to be ready by the 1st proximo, and two by the 1st September; 2,800 men are at work upon these six vessels, and it is fully anticipated that they will be completed by the stipulated time. A new sort of gunboat is also being built, which will be entirely of iron, having no woodwork whatever in its frames or sides. Its length will be 165 feet, breadth of beam 36 feet, depth of hold 13 feet 6 inches. It is to be propelled by four propeller engines. At the bow there is to be a large and formidable iron prow or ram, nine feet in length.

STEVENS'S IMPROVEMENTS IN POINT INDICATORS FOR RAILWAYS.



Mr. J. J. Stevens, of Darlington Works, Southwark, has recently patented an invention for "Improvements in point indicators for railways."

This invention is intended to indicate to the person in charge of the working of the points, when such points are at a distance from him, the proper action or otherwise of the points which he desires to work.

For this purpose a pillar is erected at the side of or opposite to the points, on the upper part of which there is a diaphragm of any desired shape, divided into two parts, capable of being separated and of being brought close together; the lower part of the disc is made movable, while the other part is stationary. By a chain or bar, the movable part is connected to a wheel or pulley at the bottom or lower part of the pillar, and to this wheel is also connected a rod attached to the "fly-rail." The point is worked by the attendant, through chains, wires, or rods, by means of a pull-over lever, in the ordinary manner; and upon the "fly rail" being brought in contact with the main rail, the parts of the disc are separated or are closed, according to the manner in which the indicator is set to act. The attendant has thus indicated to him that the points have acted in the manner he has desired, or that they have not so acted, when he can take measures accordingly.

In order to render this a night as well as a day indicator, a lamp is erected at the back of the disc with coloured glasses, which may be made by showing a different colour, or by not showing any light at all, to indicate that the points have acted properly or the reverse.

In some cases the indicators are made double, that is to say, it is caused to face both to the attendant and to the driver of the train, and thus indicate to both parties in opposite directions at the same time.

Fig. 1 is a front elevation, and Fig. 2 is a side elevation, of one of the point indicators. Fig. 1 shows its connection to the fly-rail. A is a pillar, which may be of iron or wood; B is a plate fixed on the upper part of the pillar; C is a movable plate free to be moved up and down by a chain D passing over a pulley *a*, and fixed to the pulley E, which is connected by the rod F to the fly-rail G. H is a stop fixed on the pillar A, upon which the movable plate C rests when at the bottom

of its course. Fig. 3 is an elevation of the upper part of the pillar, showing the indicator shut. In order to make the indicator a night as well as a day signal, a lamp is fixed, and coloured glasses are fitted in the upper part of the pillar, as shown at Figs. 1 and 2. The coloured glasses are fixed in a frame which rests at bottom upon the movable plate C; and this frame rises and falls with the movable plate, as indicated by the dotted lines at the back of the fixed plate B. For the purpose of showing the white and green glasses, portions are cut away from the fixed and movable plates. For the proper working of the points, it is necessary that the fly-rail should be either entirely open, or wholly closed. When open, the movable plate is separated to its fullest extent, rests upon the stop, and the white glass is visible at the bottom of the fixed plate B, indicating "all clear," as shown at Fig. 1. When, on the contrary, the point is closed, and the fly-rail rests against the main-rail, the movable plate C is raised to the top of its course, and comes in contact with the bottom of the fixed plate B, and the green glass indicating caution is visible. In the event of the fly-rail being stopped from getting home in one direction or the other, the movable plate C does not reach the end of its course, and exposes the red glass indicating danger. Should the reverse movement be required in the indicator, then the pulley E is shifted from the axis *b* to the axis *c* on the pillar A.

Fig. 4 is a front elevation, and Fig. 5 a side view of an indicator for showing a signal both to the attendant working the points and to the engine-driver. A is the pillar, to the upper part of which metal plates B B are fixed; these plates terminate at top in eyes which receive and form bearings for the axis C. The movable indicator plate P fits into or is formed in a piece with a socket D, or fixture in the axis C. E E are quadrant frames, keyed or otherwise, fixed tight on the axis C; the lower part of the frames carries coloured glasses which move opposite apertures in the plates B B, to allow of the passage of light from the double-glassed lamp F, placed between them and on the top of the pillar A. G is a fixed plate upon which the movable indicator-plate rests, say to indicate the points right for a branch line; and H is another fixed plate against which the movable plate rests, to indicate say the points right for the main line. I is a guide-rail between the plates G and H. The fly-rail is connected to the movable indicator plate through a T lever, K, connecting-rods L L, and a cross-bar M, keyed or otherwise fixed on the axis C. As in the indicator first described, if the fly-rail should not get home in one direction or the other, the indicator plate does not reach one or other of the fixed plates G H, and the red glasses appear to show danger both to the engine-driver and to the pointsman.

THE INTERNATIONAL EXHIBITION.

Class I.

(From *The Times*.)

Sharp strictures have appeared in these columns on some of the classes of the Zollverein Department, and we have heard well-informed Germans fully admit their justice. It now affords us pleasure to apply very different language to Class I. of this department, and bestow upon it high praise. It must not be supposed that the Zollverein is adequately represented in this collection, which is confined almost entirely to Prussia and Nassau. Possibly, the other members of this great Customs' Union may have been disinclined to manifest too close an intimacy with Prussia; and one member, Hanover, has openly severed all connection, and exhibits her products in a corner beyond the frontier of the Union — a sad example of disunion and isolation. The collection has been formed under the direction of Von Dechen, of Bonn, and arranged by Dr. Hermann Wedding, of Berlin. The exhibitors are under no small degree of obligation to these gentlemen for the admirable manner in which they have accomplished their task. Of its kind, no collection in the Exhibition can be more instructive than this. It is accompanied by a descriptive catalogue in English (large 8vo., pp. 106), which is copious without superfluity, and is exactly what it should be, with the single exception that it contains no information as to prices. The sole interest of many of the objects of Class I. depends on price. At the Exhibition of 1851 several excellent priced catalogues were published, among which may be mentioned those of Austria, Saxony, Russia, Belgium, and Spain. However, as it is, this catalogue is a valuable record of important facts, scientific as well as commercial, and we advise all who are interested in the subject to endeavour to procure one, especially as it is not sold, but distributed gratuitously on application.

The collection contains almost every known description of iron ore — namely, magnetic oxide, specular ore, red and brown hæmatite, spathose carbonate, and argillaceous ore, including blackband; and even bog iron ore is not absent. The specimens, which are large and well-selected, are arranged in ascending geological order, and nearly every member of the series has its representative. Thus, ores are shown from igneous and metamorphic rocks, and the following formations:—The Devonian, the carboniferous, the new red sandstone, the magnesian limestone, the trias, the lias, the oolite, the wealden, the cretaceous, and the tertiaries. The gems are the magnificent spathose carbonates from Siegen. The upper Devonian beds of Westphalia and Nassau have been found very productive of red ores of good quality; and a series of these forms an important part of the general collection. Complete information will be found in the special catalogue concerning the mode of occurrence and the localities of all these ores. We would direct attention to the Nos. 620, 621, 622 of this catalogue (No. 695 in the official catalogue), as illustrative of a process of converting the fine powder of a brown iron ore into compact masses suitable for smelting. The powder is separated by washing with water in the state of mud, which is left to consolidate sufficiently in shallow pits, and is then made into bricks; these are dried and burnt, and so rendered fit for smelting.

We understand that this interesting and instructive collection of the mineral products of the Zollverein has been offered as a present to one of our national museums, and that it has been declined on account of want of space. We trust, however, that it will not leave London, as we believe that permanent and readily accessible collections of the mineral resources of foreign countries will prove of great practical utility to our miners and metallurgists. Such collections may not, like the showy objects of decorative art, attract flocks of sightseers, but they may convey solid instruction to the observant minds of the few, and so be the means of promoting the material interests of the nation in a degree that can be little anticipated. The value of a museum is not to be measured by the mere number of gazing spectators, but by the earnest students who frequent it for the sole desire of obtaining knowledge. We beg to assure the worthy Curator of the Museum of Practical Geology, who has addressed a letter to this journal, impugning the accuracy of our statement, that Mr. Blackwell's collection of ores is only dimly visible, but the preceding observations are not intended in disparagement of the collections under his charge. The Curator invites inspection of Mr. Blackwell's collection on *fine* days; but he should also have added *dull* days, which sometimes occur in London. We invite inspection in any kind of weather in confirmation of the accuracy of our statement; and we suggest that the positions assigned to the pottery and iron ores should be compared with respect to degree of illumination.

Austria presents many objects of interest in Class I., but there is no special collection of iron ores — not, certainly, because she is deficient in these valuable minerals. There is an excellent catalogue in English, published by order of the Minister for Commerce and National Economy, with the title of "Austria at the International Exhibition of 1862;" and in this it is stated (p. 9) that in 1860 about 1,000,000 tons of spathose carbonate, argillaceous ores, red, brown, and magnetic oxide of iron, were raised, and yielded upwards of 300,000 tons of pig iron. Under No. 44 will be found samples of iron ore, stated on good authority to have been derived from the lower Silurian beds. The catalogue contains much useful and well-digested information, not only about Class I., but the Austrian empire generally, with reference to its area, administration, and commerce. We have heard some of our ironmasters recently complain of the cessation of their trade with Austria in consequence of increased import duties; and on mentioning this circumstance a few days ago to one of the best authorities on the subject of iron in the Austrian dominions, a native resident in Styria, we were informed, in a strain of some exultation, that this change of duties had proved highly advantageous to the Austrian iron works. This may be true; but whether the change will tend to promote the prosperity of the empire generally, is another and very different question, about which nothing was said.

Russia is satisfactorily represented in Class I. The collection contains many interesting objects, but is displayed in a somewhat slovenly manner. Russia has long been celebrated for her production of certain descriptions of iron, to which we shall direct attention in a subsequent article. Scarcely any specimens of iron ore worthy of particular notice are shown. One of the most conspicuous objects is a 12-pounder cast-steel gun, which is reported to have sustained 4,000 rounds without injury.

Sweden, as might be anticipated, is strong in iron. Her chief ore is magnetic oxide, of which fine and characteristic specimens from various localities are exhibited. An instructive series of the far-famed Dannemora ores and the associated rocks specially deserves attention — see No. 9. The ores from this locality are among the finest in the world; and the iron which they yield always commands a high price, on account of its producing good steel. The Swedish iron ores differ much in quality, even when in appearance they closely resemble each other. One cause of the excellence of such as are considered the best is, without doubt, the absence of phosphorus, which is constantly present in sensible proportions in nearly all British iron ores, except the red hæmatites. The lake and bog iron ores of Sweden are well illustrated. The former are particularly interesting from their mode of occurrence. They are found at the bottom of the lakes and are dredged up, and after the lapse of many years again accumulate. They are in the state of small rounded particles and flat coinlike cakes, and consist essentially of brown iron ore. In 1860 not less than 22,000 tons of lake and bog ores were raised. They furnish a fluid pig iron suitable for fine castings in which strength is not an object.

Although we propose to reserve our observations on the iron and steel exhibited for a general and connected review, yet we cannot here refrain from inviting careful attention to one object in Class I. of Sweden. It is the fore part of an iron paddle steamer, 200 feet long and of 120-horse power, which, during a fog in September 1860, and while going at the rate of eight or nine knots an hour, struck on a rock. The iron, to use Mr. Cobden's once celebrated simile, was "crumpled up like a piece of brown paper," and yet the vessel got off and proceeded without difficulty to Stockholm, about 100 miles distant. A sketch is given, showing the exact spot where the blow was received in relation to the water line. The plates were made and the vessel was built at the Motala Iron Works. No object in the entire Exhibition can appear less attractive to the eye than this, and yet when its story is told not one should excite greater interest, at least in the minds of Englishmen. Here we have ocular demonstration of the rough treatment which a ship made of really good iron has received with comparative impunity. Plates to be used in the building of iron ships ought, like boiler plates, to be made of the most tenacious iron; whereas it is well known that in the manufacture of the so-called "boat-plates" the worst iron has often been employed. Cheapness has been the cry, and

"boat plates" have been required at prices utterly incompatible with goodness of quality. The ship-owner cuts down the shipbuilder, who in his turn cuts down the iron-master, and the result is a wretched thing called a ship, which will inevitably go to the bottom under a tithe of the injury sustained by the Swedish vessel. We know not how many lives have been sacrificed to cheap "boat-plates." There is good reason for believing that during the last few years more than one accident at sea would not have been attended with such wholesale destruction of human life as happened if the ships concerned had been made of even moderately good iron. In the reconstruction of the navy, this question of the best iron for plates is of vital importance. A bad plate for such a purpose is dear at any price, and no false economy must be tolerated with regard to the iron intended for Her Majesty's ships. We have reason to know that the authorities, both military and naval, are now fully impressed with the absolute necessity of employing, irrespective of cost, only those qualities of iron which have been found by experience best adapted to the various purposes of war. The experimental investigation on iron armour for ships has now extended over eighteen months, and is still in progress. Information has been collected on the subject from every source; the opinions of the proprietors or managers of many of the leading iron-making firms in different parts of the country have been procured and recorded; plates of iron of various kinds, and manufactured in different ways, have been tested under conditions calculated to afford decisive comparative results; the maker of each plate has been invited to witness the effects of its trial; and a spirit of laudable rivalry has thus been excited which cannot fail to secure the best results for the nation. There has been no hole-and-corner work, but all has been done in the presence of witnesses who would be sure to detect the least unfairness, and who, by thus seeing with their own eyes the effects of modern artillery—effects of which no adequate conception can otherwise be obtained—have derived practical information of the highest value. It has sometimes been amusing to witness the eager excitement, reminding one of the racecourse, evinced by spectators interested in an experiment. The Committee on Iron, to which this investigation has been confided, presented a few months ago a Blue-book, consisting of 283 pages, with numerous illustrations, not forgetting, like the Thames Embankment Committee, the index—and a second will assuredly follow. But this volume is, we believe, a sealed book.

(To be concluded next week.)

Correspondence.

[We do not hold ourselves responsible for the statements of our Correspondents.]

THE STRAIGHT LINE *VERSUS* THE WAVE LINE FOR VESSELS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—I confess to a little surprise that Mr. Cheverton can coolly talk about his "refutation" of the wave-line theory, when he has not yet brought a single argument against it, but merely made two or three assertions of the views he takes; and when he calls my illustrations *idle*, it must be on account of his perfect misunderstanding of the subject he writes upon; and I am sorry he is unable to see the complete appropriateness of my illustrations.

The *uniform motion* he advocates is quite unnecessary, because a vessel in motion is only in contact with each particle in its course for a few moments; it is constantly coming in contact with fresh particles, each of which has to receive a reciprocating motion at right angles, or nearly so, to the course of the vessel, and then the vessel has done with it for the rest of the voyage. As Mr. Scott Russell says: "The "form of least resistance should be such as to remove "the particles of water out of the way of the ship just "sufficiently far to let the largest section pass, and "not a jot farther;" and this *cannot* be accomplished by *uniform* motion.

Secondly, *uniform motion* cannot be obtained with any form! And if Mr. C. will try experiments before he writes, he will find that water is quite as difficult to coerce into uniform motion as machinery.

I must repeat my advice to Mr. Cheverton to refresh his memory by referring to the many published arguments upon the subject, and if he refers to Mr. Scott Russell's admirable papers read at the Institute of Naval Architects, he will find every objection he can possibly bring against it fully answered.

I am, Sir,
Your obedient servant,
T. MOY.

1 Clifford's Inn, July 22, 1862.

COMBUSTION IN CONDENSED AIR.

SIR,—It has long been known that the heat and light evolved when any combustible matter is burned vary in a high but imperfectly-determined ratio with every variation in the density of the atmosphere in which this combustion is effected. Sir Humphrey Davy, more than forty years ago, tried some experiments, the result of which was to show that the heat, &c., from burning sulphur and alcohol rapidly diminished when the fuel was burnt in rarefied air, and increased if the air was condensed. More recently, Dr. Frankland has carried through an elaborate series of experiments by burning candles and other combustibles at different heights during an ascent of Mont Blanc. The results were explained in a lecture delivered before the Royal Society last year.

From the facts ascertained by Dr. Frankland, he came to the conclusion, that while the quantity of material burnt did not perceptibly alter under every range of atmospheric pressure, the proportion of light evolved decreased 5·1-hundredths for every fall of one inch in the mercurial barometer; that is to say, that if the unit of light from a candle or lamp, when the barometer marks 30 inches, is assumed to be =100, the light emitted when the mercury falls to 29° is less than 95, sinks below 90 when the air is of a density represented by 28 inches, and so on. This proportion Dr. Frankland believes to be accurate: at all events, within a certain range both of the ascending and the descending scales of atmospheric pressure.

The visible effects upon the flame of candles burnt under diminished densities of air are precisely those which might have been predicted on *à priori* considerations. As the air becomes rarer, the flame becomes large and feeble; the blue non-luminous portion augments in size until, at a certain point of altitude—*id est*, of rarefaction—it occupies the whole space filled with the burning particles. The reason is obvious. Every atom of hydrogen requires, by weight, about 8 times the same quantity of oxygen to burn it; and every grain of carbon requires three of oxygen, forming respectively water and carbonic acid gas. As 100 cubic inches of air, at the ordinary pressure, contain about 6 grains of oxygen, and as combustion stops when the supply of oxygen is less than double (treble?), the theoretical quantum required for combination, the gaseous or vaporised particles of fuel must, in burning, occupy such a space as that for every grain consumed they shall obtain a feeding supply of at least 200 cubic inches of air. This is the case at ordinary densities, with the barometer at 30°. As the density diminishes, the space must be enlarged, and *vice versâ*. The consequent influence upon the development of light and heat, when the air grows denser, may be assigned to a combination of two causes, viz.:—

I. A larger number of burning and incandescent particles are packed into the same space.

II. The atoms of oxygen and fuel are pressed into closer contact, and the chemical action of which the devolution of heat and light is the consequence, proceeds with increased intensity.

As a familiar example, we know that the slight condensation of air produced by cold ($=\frac{1}{480}$ in volume for every 1° Fahr.) causes a noticeable increase in the heat and light of a common fire, finding expression in the phrase that it "burns frosty."

Dr. Frankland believes that his "modulus" of 5 in the 100 for every mercurial inch of barometrical pressure obtains only through a limited range, being too high for very low pressures. *E converso*, we may conclude that it is too low for the higher densities. Experiments on this point have yet to be tried. But, taking the average as it stands, and as it has been tested by sufficient experience, we come to this conclusion—that if the atmosphere were condensed to a double pressure, viz. 60 inches of mercury, the heat and light evolved from any burning fuel would be increased in the proportion of $5{\cdot}1 \times 30$: 100; that is to say, by 153 per cent. At 90 inches the increase would be 306; and at 120 inches—representing a "bursting pressure" on the reservoir of only 45 lbs. per square inch—the gain would be at the lowest estimate 459 per cent., enhancing the original 100 of calorific or luminous effect to 559; thus in practice eliciting a nearly sixfold useful result as obtained from the combustion of any given quantity of fuel.

In its application to illuminative purposes there are some serious practical difficulties to be overcome; but the principle thus enunciated can be utilised in the production of heat without encountering any obstacles which cannot be surmounted by a little ingenuity. It is not difficult to construct chambers of any size air-tight and strong enough to bear heavy pressure, into which, as into a diving-bell or other subaqueous apparatus, air is forced and renewed, in quantities sufficient to meet the demands of the furnaces, &c. at work, and of the men employed to work them. The anticipated results are, that the fuel is more rapidly and freely burnt; that the heat produced is enormously intensified, and, at the same time, kept under complete command; that (when required) a degree of heat can be obtained by the combustion of ordinary coke or coal, exceeding that now attainable only by the oxyhydrogen blow-pipe; that all smoke will be consumed; and that the products of combustion, or of the various smelting and other processes carried on in the furnace, are under complete command, and may be so treated as to neutralise everything that is offensive, and utilise everything that is useful.

J.

THE ADMIRALTY AND INVENTORS.

SIR,—Accept my best thanks for the kindly notice of my suggestions and propositions, which appeared in last week's Magazine, under the head of "The Iron Walls of Old England," in the concluding letter of your able correspondent, "Civilian." I am greatly obliged by all manly, open, and honest criticism, for it is the true furnace to try the pure metal, if it exist. My only object in submitting my plans and propositions to the English Governmental authorities has been to do good, by simply suggesting such ideas as appeared to me feasible, as a working practical engineer of thirty years' experience among some of the largest works of the kingdom. But I regret to say my settled conviction is, that unless a man can command a full purse or high patronage, his offers (be they ever so good or valuable) will be coolly rejected by a stereotyped red tape letter, which neither condemns, approves, or adopts. This principle of "systematic rejection" is most ably shown in your leading article, page 30, "Inventors and the Admiralty," and in which you propose, or rather repeat your prior propositions, for the formation of a qualified and independent committee of gentlemen, of practical experience and liberal views, who will patiently and industriously separate the wheat from the chaff, by testing fairly and practically those samples which will bear fair handling and recognition, and by which assortment immense advantages would be secured for the country's best interests, in the selection of that which is now rejected, without reason or judgment; for I had a convincing proof of this a few years since in the receipt of an official letter, in reply to an offer of mine (made in writing), which I followed up by twenty-one personal applications; and this reply coolly informed me "that my plans and models had received investigation and inspection, and were considered not adapted for the service;" when I proved at once that my plans and models were in my own possession, and had never been examined or investigated by this (so-called) Committee in any way whatever! I was obliged to be content with the addenda information, "that I was not the only one, by many, who had been served so badly."

It is high time for England's best interests that such things should be reformed. It is this which is driving our best mechanics and inventive talent out of the kingdom. "Fair play and no favour" is all that is honestly asked for, by good and deserving men, who have their country's best interests at heart; and I trust the time is not far distant when an Englishman will find his best friends and his highest patronage can be secured in the land of his birth and training.

Yours respectfully,
W. AUSTIN, C.E.

31 Hamilton Terrace, Milford, S. Wales,
July 19, 1862.

Gossip.

Preparations are being made in Westminster Abbey for the reception of a stained glass window, which has just been completed, to perpetuate the memory of the Stephensons and other eminent engineers. In the body of the window some of the greatest engineering and architectural works of ancient and modern times are represented, and above these, at the top of the window, in five-foil, bust portraits of eminent engineers are appropriately arranged. A figure of Robert Stephenson (whose remains lie in the Abbey) is placed in the centre. Above, is his father, George Stephenson. On one side is Thomas Telford; on the other, John Smeaton; and below, the figures of James Watt, and Joseph Rennie. In order to give modern costume the more dignified and imposing appearance which belongs to the ancients, a scarf is thrown over the shoulders of each individual. The architectural works represented are bordered with ornamental tracery on each side. They consist of, on the one half of the window, the ark, the erecting of the tabernacle, the first temple, the second temple, and Menai bridge; and on the other half, the building of Nineveh, the treasure cities of Egypt, the aqueduct near Pyrgo, the Colosseum at Rome, and the high-level bridge at Newcastle-upon-Tyne.

At the evening sitting of the House of Commons on Tuesday last, General Lindsay moved a resolution to the effect that Captain Grant was entitled to some remuneration for the services he had rendered in the improvement of the means of cooking for the army. He explained the circumstances in 1855, under which Captain Grant had set up his apparatus in the camp at Aldershott, and described its superiority over the old practice which had prevailed in the barracks. It had been in operation at Aldershott ever since, and at the present time cooking was done by it for 20,000 men. Not only so, but the system had been extended to Shorncliffe, and Woolwich, and other places. But Captain Grant had not received any compensation whatever, and was 280*l.* out of pocket; and this was certainly not fair treatment. There were seven reports from commissions, consisting of commissioned officers, in which testimony was borne to the efficiency of Captain Grant's apparatus. Amongst the officers who reported in favour of it were Lord Rokeby, Sir R. Dacre, Sir J. Pennefather, and Brigadier Stanelly.—The motion was opposed by Sir G. C. Lewis, and after some discussion was negatived by a majority of one vote, 51 voting for it, and 52 against.

On Tuesday last, the Racoon, 22, 1,467 tons, 400-horse power, was taken out of Chatham harbour on Tuesday to the Maplin Sands, for the purpose of testing the working of her engines, and ascertaining her rate of speed since the alteration of her machinery, which was made at Chatham under the superintendence of Mr. Baker, chief engineer of the dockyard. The trial was made under the direction of Capt. Thompson, commanding the steam reserve in the Medway; Mr. Rumble, chief inspector of machinery afloat; and Mr. Baker and staff, from Chatham dockyard; the engines being in charge of Mr. Bonney, chief engineer of the Racoon. During the trial six runs were made at the measured mile, with full boiler-power, giving an average of 10·75 knots per hour at full speed, half-speed not being tried. The result of the trial was hardly so satisfactory as had been anticipated, the vessel, since the alterations and improvements made in her machinery, having been expected to attain a higher rate of speed. During the runs the number of revolutions made by the screw was 58 at full speed, with a pitch of 26, the screw being Smith's common propeller, not variable, with the leading corners removed. The draught of water forward was 16 feet, and aft 17 feet 2 inches; vacuum, 26; and the temperature of the engine-room, 68.

"One object," writes Mr. W. Lassall, from Malta, on the 13th of May last, "on which I scarcely intended to bestow any attention, has fascinated me greatly—I allude to the moon, in which I see minute details with a hardness and sharpness and reality I have never seen before. My opportunities of scrutiny have, however, been fewer than might have been supposed from my having frequently been engaged in showing this very popular object to many visitors. Yet, notwithstanding that, I have thus been able to see more into the moon than ever before—so much so, that I believe if a carpet the size of Lincoln's-inn-fields were laid down upon its surface, I should be able to tell whether it was round or square. I see nothing more than a repetition of the same volcanic texture, the same cold, crude, silent, and desolate character which smaller telescopes usually exhibit."

FANCY RIFLES.—A correspondent of the *Times* says:—"The tabular statement of which I send you a copy, giving the result of the trials recently made under the superintendence of the Ordnance Select Committee, to test the relative merits of the small-bore service rifles, is so favourable to Lancaster's system that I am induced to beg you will inform those interested as I am in procuring the best rifle, whether these trials, reported to have been made with the greatest care, are to be relied on, and whether the oval bore is preferred in the service. These returns show that the small-bore Enfield is superior to the Whitworth, and that the Lancaster is 50 per cent. better at all ranges. I understand that the diagrams represent the targets made by five rifles of each kind firing 20 rounds of Whitworth ammunition; that the arms were not only all made under the direction of Colonel Dixon at Enfield, but that the Whitworths were finished and turned out by Mr. Whitworth himself, impressed with all the excellence his peculiar system is capable of imparting:—

EXPERIMENTS WITH SMALL-BORE (·451) RIFLES.

	300 Yds. Inches.	500 Yds. Feet.	800 Yds. Feet.	1000 Yds. Feet.	1200 Yds. Feet.
Lancaster	4·20	0·50	1·01	1·87	3·90
Enfield	5·25	0·87	1·76	2·55	4·40
Whitworth	5·76	0·70	1·62	2·88	5·52

Mr. W. Baliard, of New York, has an invention, which consists of constructing a vessel of frames of iron and interposed frames of wood, and in covering the frame with two or more series of flat diagonal bars crossing each other in opposite directions, and an outer series of longitudinal plates, the whole being bolted together and combining to make a very strong vessel, capable, in a high degree, of resisting the impact of heavy projectiles. Its ports are made with angular or V-shaped faces, that the projectiles may glance off in striking. Between the port-holes there are constructed heavy wooden buttresses, which make the ports like the embrasures of forts.

The International Electric Telegraph Company is about to lay a cable from the Ness Point to the coast of Holland, and men are now engaged in laying down pipes to carry the wire from Lowestoft telegraph office to the Ness Point.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

STEAM ENGINE, &c., 34, 65, 85.
BOILERS AND FURNACES, &c., 92.
ROADS AND VEHICLES, &c., 33, 44, 77.
SHIPS AND BOATS, &c., 36, 47, 72.
CULTIVATION OF SOIL, &c., 27, 71.
FOOD AND BEVERAGES, &c., 18, 63.
FIBROUS FABRICS, &c., 20, 31, 45, 46, 47, 54, 64, 87.
BUILDING MATERIALS, &c., 76.
LIGHTING, HEATING, &c., 25, 30, 32, 37, 60, 61, 66, 67, 69, 73, 81, 84, 90.
FURNITURE AND APPAREL, &c., 19, 26, 40, 43, 51, 53, 57, 75, 91, 94.
METALS, &c., 28, 29, 56, 86, 88.
CHEMISTRY AND PHOTOGRAPHY, &c., 23, 95.
ELECTRICAL APPARATUS, &c., 58, 59, 79.
WARFARE, &c., 22, 24, 52, 68, 89.
LETTER-PRESS PRINTING, &c., 38.
MISCELLANEOUS, 21, 35, 39, 41, 42, 43, 50, 55, 62, 70, 74, 78, 80, 82, 83, 93.

18. W. EDGE. *Improved apparatus for roasting coffee.* Dated Jan. 2, 1862. (A communication.)

This apparatus is composed of a sphere of sheet iron or other metal (to be turned over a fire by the aid of a crank) surrounded by an envelope or casing of similar material, or of cast iron, which will cause the flame and smoke from a fire beneath to circulate all around the sphere, and which will have a fixed and a movable part. The fixed part (which should be of the thinnest cast iron) will have a sloping cut to permit the passage of the revolving sphere, the axle of which it will support, and to which it will be nearly concentric, but, by reason of the sloping cut, interrupted, and, as it were, cut by a horizontal plane; and on this side it will be covered with another casing slightly eccentric to and forming part of the first, a passage being left for the smoke which will redescend between them and escape through a pipe joined thereto. The movable part of the casing will be arranged so as to lift and turn back behind the fixed part to give passage to the sphere when it is desired to inspect or arrest the roasting. *Patent abandoned.*

19. A. M. P. AIRIAN. *A new musical instrument called "lute organ."* Dated Jan. 2, 1862.

This invention is not described apart from the drawings. *Patent abandoned.*

20. W. A. FELL. *Improvements in the manufacture of bobbins, and in the means or apparatus employed therein.* Dated Jan. 2, 1862.

This consists in a mode of manufacturing bobbins in parts held together by screwing. The formation of the fitting parts, and the connection thereof, are obtained by mechanical means. *Patent completed.*

21. M. CARTWRIGHT. *Improvements in the manufacture of models and of plates or pieces for artificial teeth.* Dated Jan. 2, 1862.

This consists in a method of manufacturing models used for preparing "plates" or "pieces" for artificial teeth of vulcanite, ebonite, or hardened rubber, alone or combined with soft vulcanized rubber; also in combining or amalgamating indiarubber and guttapercha with metals for the manufacture of artificial teeth or pieces, and for other purposes. *Patent abandoned.*

22. G. JEFFRIES. *Improvements in breech-loading fire-arms and in the apparatus for the manufacture of cartridges.* Dated Jan. 2, 1862.

According to one part of this invention, the inventor mounts the barrels on a centre or axis on one side of the centre line of the piece, and at a distance of some inches in advance of the breech end of the barrel. This centre or axis is carried in a suitable bearing connected with the false breech, and which is flat and at right angles to the centre line. The breech ends of the barrels are so made as to fit closely against the false breech, when the barrels are in their places ready for firing; but in turning the barrels partly round laterally about their axes, the breech ends of the barrels will immediately be freed from the false breech, the axis as before mentioned being placed at a distance from the centre line of the piece. When the barrels have been moved a sufficient distance sideways to allow cartridges to be introduced freely into their breech ends, they are stopped by a spring-catch provided for the purpose. The barrels are retained firmly in position for firing by a specially-constructed wedge piece. *Patent completed.*

23. H. ESCHWEGE. *Improvements in treating wood and other vegetable spirit.* Dated Jan. 2, 1862.

The patentee has ascertained by numerous experiments that charcoal—particularly well-burnt wood charcoal—when used at ordinary temperatures in a series of filters of sufficient size, has a most beneficial effect in purifying spirit (whether obtained in the manner of wood spirit, or from fermented vegetable substances), if the affinity which the spirit has for certain impurities be first destroyed by largely diluting it with water, and then subjecting this distilled spirit to the action of a series of wood-charcoal filters (preferring at all times that the temperature should not exceed 70° Fahr.), so that each successive filter shall effect the filtration of a purer and purer spirit, the same spirit never passing through a filter to which it has already yielded its impurities, but only through filters lower down in the series. When it is ascertained that the filtered diluted spirit which is coming away from the last filter of the series is not any longer sufficiently pure, the first filter of the series is to be removed and a fresh filter to be introduced and made the last filter of the series; and the supply of diluted spirit is to be introduced into what was the second filter of the series, and so on continuously as the filters require to be changed. After this process of purification the filtered spirit is to be brought to the desired strength by distillation. *Patent completed.*

24. E. NUGENT. *Improvements in fire-arms.* Dated Jan. 3, 1862.

This relates to a class of fire arms intended to be used chiefly for field service in the army, and for action in the navy. The arm is designed to fire small balls with great rapidity and accuracy by giving the usual form and partially fixed support of a gun-carriage to an arm capable of combining accuracy and rapidity. The invention is not described in detail apart from the drawings. *Patent completed.*

25. G. STRACEY. *Improvements in the manufacture of artificial fuel (fuel).* Dated Jan. 3, 1862.

Here the inventor takes aluminous matter and carbonate of lime, and combines them with coal and saw-dust and a very small proportion of cut straw, in the proportions of about four parts of carbonate of lime to one of aluminous matter, and about four parts of saw-dust to one part of coal, and he mixes these together with a small quantity of cut straw, and this mixture he subjects to a powerful pressure, forming it into blocks of different sizes as desired. The above fuel requires to have a small portion of coal or coke burnt with it to produce a brilliant and powerful fire, and fuel thus manufactured is considerably less costly than coal or coke, and is well adapted for furnaces, kitchen-ranges, stoves, hot-houses, &c. *Patent abandoned.*

26. T. S. BELLOCHE and H. BOLLACK. *An improved parasol.* Dated Jan. 3, 1862.

This consists in constructing the frames of parasols in two parts, jointed together with a free hinge; the top part of the frame is attached to the handle, and overlaps and works freely on it; the other or overlapped portion of the frame is attached in the usual way at the top. When the parasol is closed, the lower half of the frame, with the cover stretched upon it, will fold back over the upper part, forming a shape similar to a cone, the apex downwards. By forming the edge of the cover with a border or trimming of artificial flowers, the parasol when shut will represent a large bouquet or vase of flowers. *Patent completed.*

27. W. E. GEDGE. *Improvements in apparatus for dressing, cleaning, or sifting grain.* (A communication.) Dated Jan. 4, 1862.

This invention is not described apart from the drawings. *Patent completed.*

28. G. W. ARUNDELL. *An improved method and improved apparatus for treating and dressing ores and minerals, particularly applicable to tin, lead, copper, zinc, and iron ores.* (A communication.) Dated Jan. 4, 1862.

This invention is not described apart from the drawings. *Patent completed.*

29. I. W. ARUNDELL. *An improved method and improved apparatus for removing impurities from coal, parts of which invention are applicable for the separation and cleansing of ores and other minerals.* (A communication.) Dated Jan. 4, 1862.

Here the screenings are caused to fall upon a shoot over which a stream of water flows, and with the water are passed by the shoot into a hollow drum perforated at the sides, this first drum being placed within a larger drum perforated with smaller holes than the inner drum, the screenings as they fall from the drum being deposited on to a rotating picking table; a boy removes all slate and other impurities, and a fixed scraper causes the cleaned coal to fall into a tram-wagon, or other receptacle. *Patent abandoned.*

30. I. W. ARUNDELL. *An improved method of communicating motion to fan ventilators, particularly applicable to ventilating mines.* (A communication.) Dated Jan. 4, 1862.

This consists in having a screw cut on the axis of the fans in which the teeth of a toothed wheel of suitable size work. The teeth of the toothed wheel are cut obliquely, and of the same pitch as the screw. The wheel must be of sufficient size to cause the fans to revolve with the required velocity, but the size of the wheel need not be greater than to cause the fan to revolve ten times while the wheel revolves once. The wheel may be driven by manual or other motive power. *Patent abandoned.*

31. C. CROSS and E. PADMORE. *Improvements in the manufacture of piled fabrics, and in machinery or apparatus employed therein.* Dated Jan. 4, 1862.

This consists: 1, in arranging the pick so as to form both the foundation and pile of the fabric; 2, in introducing various materials of different colours into the pile fabrics; 3, in cutting the pile of any weft pile fabric as the fabric is woven, by introducing into each race a strip of metal, having a sharp cutting edge, so that, as the fabric advances to the breast beam, each race may be cut and the pile thereby formed. *Patent abandoned.*

32. R. H. COTTER. *An improved apparatus for suddenly producing a permanent light.* Dated Jan. 4, 1862.

This consists of a lamp provided with a wick for burning paraffine, coal oil, or other inflammable fluid, in connection with an apparatus for striking an ordinary Congreve or other friction match. *Patent abandoned.*

33. G. LEYSHON and D. BECKLEY. *An improvement or improvements in breaks for retarding and stopping carriages on railways.* Dated Jan. 4, 1862.

In carrying out this invention, the inventors fix upon one or both of the axles of the carriage a disc, or break-wheel, and over the said break-wheel or wheels is a shaft supported in bearings on the bottom of the carriage, and running parallel with the longer sides of the carriage. Around each of the break-wheels is a clip or nearly circular band or bar of iron, and on the said shaft, and immediately above the break-wheel, is a screw which engages in a screw-box or nut on one end of the said clip. The other end of the said clip has a nut through a hole in which the shaft passes, the said nut being incapable of moving along the said shaft. When the shaft is turned in one direction, the two ends of the clip are brought nearer to each other, and the clip is tightened on the break-wheel; and when the shaft is turned in the other direction, the two ends of the clip are separated, and the clip is no longer pressed upon the break-wheel. *Patent abandoned.*

34. J. HOWDEN. *Improvements in steam-engines and boilers.* Dated Jan. 4, 1862.

This invention refers to a previous patent, dated Nov. 21, 1860, and comprises much detail, which we cannot devote space to here. *Patent completed.*

35. H. D. POCHIN. *An improved soap or size.* Dated Jan. 4, 1862.

Here the patentee takes the ordinary resin of commerce and grinds it to a fine powder, and afterwards mixes it with soda-ash or pearl-ash. He places this mixture in a pan and heats it either with steam or fire heat until complete combination has been effected. When cold he breaks it up into small pieces or grinds it to powder. In making the size he dissolves a certain quantity of the anhydrous soap in water, and adds thereto an aqueous solution of his patent aluminous cake, ammonia, alum, or other aluminous salt. *Patent completed.*

36. G. T. BOUSFIELD. *Certain new and useful improvements in machinery for propelling water-craft.* (A communication.) Dated Jan. 4, 1862.

The object here is to enable screw propellers to be located at or near the longitudinal centre of a vessel, and at the same time to be wholly or partially submerged. To this end the first part of the invention consists in combining a screw propeller with a recess in the side of the body of the vessel, so that a portion of the propeller revolves in the recess and a portion thereof revolves outside of the recess. The object of the second part is to enable a gudgeon of the shaft of a screw propeller to be sustained in a bearing under the surface of the water and outside of the vessel's side: this part of the invention consists in combining a screw propeller with a chamber projecting from the vessel's side, the chamber being located in such a position that it contains within it the pillow block of the propeller shaft. *Patent completed.*

37. A. WARNER. *Improvements in preparing materials for and in purifying coal gas.* Dated Jan. 4, 1862.

Here the inventor employs the cinder or oxide of iron obtained from puddling, reheating, and refining furnaces used in the manufacture of iron, and which are now, for the most part, waste products in such manufacture. These materials are ground and then washed in water, and are used in apparatus such as are used when purifying gas by what are known as the dry processes. *Patent abandoned.*

38. J. CORYTON. *An improved type machine.* Dated Jan. 4, 1862.

This consists of a machine in which the types are successively stamped upon a travelling bar of lead, or other soft substance, the matrices being composed in a steel or other hard metal box, which moves at right angles, or nearly so, to such bar of lead, &c. The words and symbols when formed are set up in a grooved chase, and are available as printing surfaces in any of the modes of printing ordinarily employed. *Patent abandoned.*

39. A. V. NEWTON. *An improved manufacture of cigars.* (A communication.) Dated Jan. 6, 1862.

Here a gauze tubing is filled with fine cut tobacco and surrounded by a binder and wrapper of leaf tobacco. *Patent completed.*

40. G. G. W. and J. BETJEMANN. *Improvements in dressing-cases, applicable to other cases and boxes.* Dated Jan. 6, 1862.

This consists in an arrangement of quadrants, levers, and connecting rods, for opening or letting down a front flap and of opening out one side tray at one or both sides of the dressing-case, upon the raising of the top or lid thereof. The action may be applied to both flap and side tray, or side trays, or to either separately. *Patent completed.*

41. P. B. O'NEILL. *Improvements in screw wrenches or spanners.* Dated Jan. 6, 1862.

Here, when constructing a wrench, the inventor employs a suitable rod or metal bar, one end of which is formed as a handle, and the other end is forked. To the ends of the two prongs of the forked bar one jaw of the wrench is fixed firmly; the other, or movable jaw, has a slit formed in it, through which the prongs of the fork pass, so that the movable jaw may be capable of sliding on the forked bar towards or from the fixed jaw. For securing the movable jaw two spring catches, turning on a pin or pins, are fitted into the slot through the jaw, so that they stand in the space between the prongs of the forked bar, and teeth are formed on the inner sides of each prong of the fork for these catches to take into. Hence, in order to shift the movable jaw from one position to another, it is only necessary to free the spring catches from the teeth on the forked bar to slide the jaw to the position required, and allow the catches again to drop into the teeth. Modifications are included. *Patent completed.*

42. W. T. KITE. *Improvements in the manufacture of starch and in apparatus employed therein.* Dated Jan. 6, 1862.

Here the inventor takes flour, and makes it into dough by kneading it with a suitable quantity of water. The dough when made is placed in a trough or vessel in which are surfaces having points or spikes upon them, and these surfaces, having a vibratory or other movement communicated to them, continually perforate the dough; streams of water run over the dough during this operation, and wash away the starch from it. The spikes penetrating the mass of dough insure the access of the water to every portion of it. The water with the starch escapes from the trough or vessel through holes covered with wire gauze or finely perforated metal; it runs into a vat where the starch is deposited; the supernatant water is let off, and the starch is again mixed up with a small quantity of water, to which acetic acid is added. This mixture is allowed to stand, by which the impurities from the starch rise to the surface, and are skimmed off. When the purification is complete, the starch is made up for sale in the usual way. *Patent abandoned.*

43. F. BROWN. *Improvements in kitchen ranges and cooking apparatus.* Dated Jan. 6, 1862.

Here a boiler is applied to the side of the fireplace of a range, and is so arranged as to allow heat and the products of combustion to pass under or over, or both over and under, the boiler at the side of the fire. Beyond the boiler is an oven or ovens, so arranged with a flue or flues that the heat and products after so passing the boiler (at the side of the fire) may then be conducted over or under, or both under and over, the oven or ovens which are beyond the boiler. Dampers or slides are used to regulate and direct the course of the heat and products of combustion from the fire to the oven or ovens beyond the boiler. A hot plate or plates is or are arranged over the boiler and oven or ovens. *Patent completed.*

44. F. SHAW. *A system of stopping railway trains.* Dated Jan. 7, 1862.

This consists in an arrangement whereby all the carriages or wagons composing a train may be furnished with independent break power, and to effect this object the patentee proposes to apply breaks to all the wheels of a four-wheel carriage, and to the four outer wheels of a carriage having six wheels, the breaks to be so connected to the buffer rods by spring levers that, by pressure upon the buffers, the breaks are applied to the periphery of the wheels. *Patent completed.*

45. I. HIGGINS and T. S. WHITWORTH. *Improvements in machinery or apparatus for spinning and doubling cotton and other fibrous materials.* Dated Jan. 7, 1862.

This consists, 1, in a method of obtaining the drag, and consists in causing the spindle to be pressed by a metallic surface. According to another part of the invention the patentees support the spindle by a tube projecting into the bobbin, and the bobbin by a cap which is carried by the spindle. Another part consists in so mounting the flyer that it may be moved sideways from the spindle, so as to facilitate the removal of the cop or bobbin. Another part relates to a method of obtaining an end for the commencement of another cop or bobbin, and consists in a provision for raising the spindle, so as to bring a bare part up to the level of the guide or other apparatus through which the yarn or thread passes. *Patent completed.*

46. J. TATHAM. *Improvements in machinery or apparatus for preparing, spinning, and doubling cotton and other fibrous materials.* Dated Jan. 7, 1862.

This consists, 1, in the use of that form of sheet metal usually termed corrugated, for the covers of scutchers or openers, also for the covers of carding engines, and for the manufacture of cylinders to be used as surface motion drums, that is to say, such drums as are used for unwinding or winding fibrous materials by revolving in contact therewith. Also the patentee uses the said corrugated metal for making cylinders to be used as clearers for the top rollers of preparing and spinning machinery. The drums and rollers as aforesaid, may be fitted with axles in any ordinary way. Another part of the invention relates to the doffer or stripper combs of carding engines, and consists, 1, in forming them after the manner of "angle iron;" or he forms the section of the said combs or strippers as a curve which may constitute a whole circle. *Patent completed.*

47. B. FOSTER. *Improvements in machinery or apparatus for spinning and doubling wool and other fibrous materials.* Dated Jan. 7, 1862.

Provisional protection has not been allowed for this invention.

48. A. WALLIS and C. HASLEM. *Improvements in rotary screens.* Dated Jan. 7, 1862.

Here, in forming rotary screens, the patentees make up a frame of metal bars, as before, and these bars are notched at the periphery of the drum externally at the places where the wire (which is applied as before or in separate hoops) rests upon them. When the bars so formed are made up into a frame, these notches are to be on the exterior of the frame; the notches in the bar receive the wire and prevent it moving laterally. The wire is prevented springing out of the notches by riveting over the projections or studs between the coils of wire. *Patent completed.*

49. D. BEALE. *An improved method of fastening iron plates to ships' sides.* Dated Jan. 8, 1862.

Here the inventor commences at the lower part of the vessel by driving from the outside peculiar formed bolts, which he calls "dovetail eye bolts," through the eye of which is inserted a dowel or pin through the vessel's side, leaving the head of the bolt and dowel or pin projecting outside the vessel. The plates are so constructed with recesses at the lower edge as to receive the dovetail head of the bolt, and the dowel or pin, and the upper edge with holes to receive the dowels or pins only. One end of the plates will be grooved, and the other end tongued. The plates are then placed so that the heads of the bolts and dowels or pins shall fit in the recesses of the same; another row of the same kind of bolts without the dowel or pin is driven above these plates, and then the dowel or pin is driven through the eye of the bolt, and into the holes or recesses in the upper edge of the plates, whereby saving of labour is effected and few bolts required. The bolts are fastened on the inside of the vessel by nuts and screws. *Patent abandoned.*

50. L. WUNDER. *Improvements in the manufacture and composition of soap.* Dated Jan. 8, 1862.

Here the soap is to be composed of equal parts of the best tallow and of the finest cocoa-nut oil, well boiled with water, to which will be added about 2 lbs. weight of salt, and a quarter of a pound of burnt alum ("alumium ustum") for every 200 lbs. weight of the above fatty matters, to which, when taken off clean from the deposit, will be added natron and kali, in the proportion of about 90 lbs. of natron and 100 lbs. of kali to every 200 lbs. of the fatty matters. To every 100 lbs. weight of the mass will be added about 2 lbs. weight of finest catechu, and about 5 oz. of tincture of armica, and it will be perfumed by the addition of about 1 oz. of cinnamon oil, 2 oz. of oil of lavender, and 2 oz. of cumin oil or other perfumes. *Patent abandoned.*

51. A. HEATH. *Improvements in the construction of ink-stands.* Dated Jan. 8, 1862.

This consists principally in being able to fill the smaller vessels or ink-cup at pleasure, from the larger one in which it is placed, in protecting the point of the pen from the sediment of the ink, and in limiting the quantity of ink in the cup, so that the pen can only take up so much as it will hold, but which quantity may be increased or diminished, to suit the pen in use at the pleasure of the writer. *Patent completed.*

52. S. JESSON, J. BATSON, J. MOORE, and J. ROBERTS. *Improvements in the manufacture of gun-barrels and wrought-iron tubing.* Dated Jan. 8, 1862.

Here the inventors take a bloom of wrought iron, and, after beating it, pass it through a pair of grooved rolls, by which it is elongated and its diameter reduced. This billet, while hot, is now passed through a second pair of grooved rolls, the grooves of which rolls give to the billet the shape of a semi-hollow cylinder or half tube, the interior being nearly semi-cylindrical, and the exterior having three or more planes or sides. The edges of the half-tube are not plain, but have each a bead or rib running along its whole length. The inventors take a second billet, and by grooved rolls they roll it into a shape similar to that last described, excepting that, in place of ribs or beads running along the edges, they make grooves or depressions in the edges of a figure corresponding to that of the ribs or beads on the first-made half-tube. The two half tubes are then placed together, so that the beads or ribs on the edges of one engage in the grooves or depressions in the edges of the other. The two half-tubes thus fitted together are heated in a mill furnace, the partially-formed tube resting on one of the planes on its outside. It is heated to a welding heat, and, properly heated, is removed from the furnace, and passed through a pair of grooved rolls, by the pressure of which the two half tubes are welded together. *Patent abandoned.*

53. C. and T. PILKINGTON. *Improvements in skates.* Dated Jan. 8, 1862.

This consists of a metallic skate composed of any suitable description of metal, such as iron, steel, tin, zinc, brass, German silver, or other metal, or combination of tin or more metals, either in alloy or otherwise. The form of the body of the skate is stamped out or raised by dies in the usual form of skate clog. The sole is similarly shaped and soldered on. *Patent completed.*

54. J. BARBER. *Improvements in hand-mules, consisting of a break and backing off motion.* Dated Jan. 8, 1862.

Here the inventor places a pulley upon the main shaft of the mule, and a corresponding fast and loose pulley on the first mover, the strap being adjusted so as to drive in the contrary direction to the revolution of the driving pulley. This strap passes through a strap-fork attached to a sliding-bar, to which is connected a weighted bell-crank lever, which has a constant tendency to throw the strap on to the fast pulley, but is prevented from doing so by a catch which holds against a projection on the sliding-bar. A short time before the 'draw' or stretch of yarn has received its full quantity of twist, a finger on the twist-shaft strikes the above-mentioned catch, releasing the sliding-bar, which the weighted lever sets in motion, causing it, by means of the strap-fork attached thereto, to throw the strap from the loose pulley on to the fast pulleys. The strap thus applied, and moving in the opposite direction to the driving-strap, acts as a powerful break in checking the velocity of the first mover, and reversing its motion, thus entirely superseding the manual labour of the spinner in "breaking" and "backing off." The breaking is finished and the backing off commenced simultaneously with the time that the draw has received its full amount of twist, and immediately before the spindles commence "winding on." *Patent abandoned.*

55. J STENHOUSE. *Improvements in rendering certain substances less pervious to air and liquids.* Dated Jan. 8, 1862.

This consists in the use of paraffine for rendering leather, thread, cord, ropes, and textile fabrics composed of cotton, linen, or wool, &c., less pervious to air and liquids. *Patent completed.*

56. H. BESSEMER. *Improvements in the machinery and apparatus employed in the manufacture of malleable iron and steel.* Dated Jan. 8, 1862.

This consists in certain combined arrangements, whereby the steam employed for forcing air is generated by means of the heat escaping from the reverberating furnaces used in melting the iron to be converted. Also in the opening and closing of the passage conducting air into the connecting vessels, by means of the rotatory action of such vessels acting on a suitable valve. Also in the employment of several separate tuyer boxes attached to the under side of converting vessels, in which the air is forced vertically upwards through the molten metal. Also in the use of tuyer boxes, with sepa-

rate compartments for the several tuyers employed. Also in giving rotatory or semi-rotatory motion to converting vessels that are supported on fixed standards or foundations by means of hydrostatic force. Also in employing a pair of converting vessels so placed in regard to each other that the flame and splashes emitted therefrom shall be projected in opposite directions, the said vessels being capable of discharging the converted metal into a ladle placed between them. Also in the use of chimneys, with an open space beneath them for giving access to converting vessels employed in the production of malleable iron or steel, by forcing air through the fluid metal. Also in the use of two converting vessels with separate chimneys, and one hydraulic casting crane, grouped together as shown in the drawings. Also in the use of hydraulic cranes in casting malleable iron or steel, as described. There are various features included in the specification. *Patent completed.*

57. W. BRADSHAW. *Improvements in watches.* Dated Jan. 8, 1862.

This relates to a novel arrangement of the works for actuating a centre seconds wheel and hand. By this improvement the centre seconds hand is mounted on a pivot, and is carried over the other handles without the necessity of using the extra wheel which is usually used for this purpose in watches provided with a centre seconds hand. The power for actuating the centre seconds hand is gained from the third wheel, and is carried out by two extra wheels and three pinions; one of the wheels is on the centre seconds shaft, and the other is an intermediate wheel which actuates the fly pinion. The second power is directly connected with the independent seconds hand being attached to the same arbor or shaft that carries the seconds hand. For this purpose there is an extra power or spring enclosed in a box or collet on the seconds hand shaft, and on this same shaft is a pinion which gears into and is driven by the third wheel. *Patent completed.*

58. H. COOK. *An improved mode of and apparatus for propelling by the agency of electricity.* Dated Jan. 8, 1862.

The patentee claims the application of the tractive power of electric coils to cause an armature of iron constructed in the form of a hollow vessel casing carriage (made to contain articles of various kinds) to pass along a continuous line of rails placed within and extending throughout series of tubular electric coils, as herein set forth. *Patent completed.*

59. C. W. SIEMANS. *Improvements in the means and apparatus employed for insulating and protecting telegraph-conducting wire, and in apparatus for working the same.* (Partly communicated.) Dated Jan. 9, 1862.

Here, according to one part of the invention, the patentee forms the conductor either of a solid metal wire, or of a strand of two or more wires; or he sometimes first forms a strand of seven equal-sized wires, and then winds into the said helical recesses formed between these wires six other conducting wires of a smaller diameter, so as to cause the form of the complete conductor to approximate to that of a cylinder, which form would present the least surface for induction for a given sectional area. He causes the conductor to pass through a vessel containing either a compound of gutta percha, resin, and Stockholm tar, in a heated or semi-fluid state. The wire or strand of wires passes into and out of the vessel through holes or dies formed in the sides of the same. The conducting wire is next passed through a bath of cold or iced water, then passed round a series of rollers or reels so as to harden the coating; it is then coated with india rubber, and finally with gutta percha. In making joints in the india rubber covering of the conductor, he overlaps the uncovered part with india rubber strips, and completes the formation of the joint in a specially-constructed apparatus. *Patent completed.*

60. J. SMITH and S. WELLSTOOD. *Improvements in cooking stoves and ranges.* Dated Jan 9, 1862.

This invention is not described apart from the drawings. *Patent completed.*

61. J. BRUNT. *Improvements in gas meters.* Dated Jan. 9, 1862.

This consists, first, in the use of two floats attached to the valve stem, and having a common vertical movement, the box containing the floats being divided into two parts or chambers by a partition descending under the surface of the water between the two floats, one of these parts or chambers receiving the inlet gas before its passage into the drum of the meter, whilst the other chamber is in communication with the outlet gas which has passed through the drum of the meter. By this arrangement, a depression in the level of one chamber always corresponds to a nearly like elevation of level in the other chamber, so that the position of the floats or compound float is but slightly changed by the variations of level in the two chambers, whereby the inlet valve can be adjusted with precision. In draining off the overflow water from the syphon-pipe the patentee makes use of a plug or screw to which a rod is attached, on the upper part of which a weighted lever is supported; on withdrawing the plug for the passage of the overflow water, this weighted lever depresses the float, which, bringing the valve home on its seat, intercepts further passage of gas until the plug is returned to its former position. *Patent completed.*

62. T. A. WESTON. *A new or improved multiplying gearing for transmitting and multiplying power, which said gearing may be applied to cranes, windlasses, capstans, and presses, and to other purposes where it is required to transmit and multiply power.* Dated Jan. 9, 1862.

We cannot here devote space to the details of this invention. *Patent completed.*

63. D. WILSON. *Improvements in machinery for pulping and preparing coffee.* Dated Jan. 9, 1862.

For the purposes of this invention an annular rotating rubbing surface is used, together with another, and by preference a fixed or stationary, annular rubbing surface placed either above or below it. The rotating rubbing surface is mounted on and carried by an upright axis, to which rotatory motion is communicated in any suitable way. The annular rotating surface moves in a horizontal plane, and the other annular rubbing surface is fixed in a plane parallel to it; above these rubbers is fixed a conical hopper, into which the coffee berries are to be placed, and a constant supply of water applied to them. In order that the berries and the water may descend from such hopper so as to be fed in all directions between the annular rubbers, there is around the inner edges of the rubbers, and within the hopper, a cone, the apex of which is upwards; the lower or delivering part of the hopper is thus formed into an annular passage, corresponding in dimensions with the inner edges of the rubbers; hence, as the coffee berries and water descend in the hopper, they pass in between the annular rubbing surfaces at their inner edges, and are rubbed between such surfaces, and pass out at their outer circumference, and the matters as they pass out from between the rubbers are received in a trough. *Patent completed.*

64. H. CHARVET. *Improvements in the spinning of cotton and in its various applications.* Dated Jan. 9, 1862.

Here the inventor, after he has passed the raw cotton or cotton wool through the beater or scutcher, dyes it of various colours, according to the effect or design he intends to produce; he then repasses it by the opener and the lap scutcher, on leaving which he submits it to the carding machine, then to the combing machines, and then to the shifting or bobbin frame. The mode of preparation will vary according to the lighter or deeper mixture, or more or less apparent design to be produced. *Patent abandoned.*

65. D. WILSON. *Improvements in hydraulic presses.* Dated Jan. 9, 1862.

This refers to preparing seeds or fatty and other substances in order to express oil therefrom; and, where it is desirable, first to form the substances into circular cakes to be placed in a suitable press to have the oil expressed therefrom, such preparatory process is performed in a press having a long cylinder with a ram or piston capable of being moved by hydraulic or other power from the lower to the upper end thereof, the substances to be pressed being supplied in regulated quantities, in a manner which we cannot here describe in detail. *Patent completed.*

66. J. H. TATUM and W. J. WILLIAMS. *Improvements in the manufacture and structure of wicks, and in the application of the same to the manufacture of candles.* Dated Jan. 9, 1862.

Here the patentees construct a new form of wick by one single operation of a machine (not described apart from the drawings) resembling in its exterior the ordinary three-strand braiding machine, but totally different in its interior. They introduce into one of the shafts a hemp or flax cord or string, and into the other a soft cotton or woollen cord or string, which cords, being taken up in the braids in the form of a core, a wick is formed of great capilarity. The cords or cores, and a portion of the cotton forming the strand in the braid, are steeped in an aqueous solution containing chemicals that will dissipate the ash. *Patent completed.*

67. R. A. BROOMAN. *Improvements in apparatus for carburetting and burning gas.* (A communication.) Dated Jan. 9, 1862.

The patentee claims, first, the employment in apparatus for carburetting and burning gas of a wick and burner, the said wick being protected and capable of absorbing and raising the carburetting liquid, as described. Second, the employment of a current of air between the carburettor and the tube leading to the burner, as described. Third, the employment of two currents of gas, one of which is carburetted as described, while the other is ordinary coal gas and passes direct to the burner, where both currents are consumed together. The apparatus employed is not described apart from the drawings. *Patent completed.*

68. B. THOMPSON. *Improvements in ordnance and fire-arms, and in projectiles to be used therewith.* (A communication.) Dated Jan. 9, 1862.

This consists in forming the barrels of fire-arms and ordnance with ribs or guide ways down the length of the inside of the tube, in a line parallel with its longitudinal axis, and in making the breech end of such ordnance or barrels to contain a charge or exploding chamber of peculiar form, to suit the projectile described; and also in the form of projectile which is specially adapted for use, with the description of ordnance or barrels aforesaid. The invention is not described apart from the drawings. *Patent completed.*

69. H. BARBER. *Improvements in safety lamps.* Dated Jan. 9, 1862.

One object of this invention is to render it impossible for the workman to remove the lights from the lamp, or even to attempt to do so, without detection. This is effected by attaching to some fixed part of the lamp a piece of thin steel, or other suitable brittle substance, in such a manner that the lower part of the lamp cannot be removed from the upper part or gauze protector without breaking the brittle substance. A convenient way of doing this is to attach the piece of steel, &c., to the lower part of the lamp, so that when any attempt is made to unscrew the bottom part, an arm, pin, or other projecting piece will be brought against this brittle piece, and will break it off. As the workman will be unable to supply or replace the defective part, this will at once show that the lamp has been tampered with, and the man will be dealt with accordingly. The inventor also proposes to adapt an extinguishing tube to the wick holder, and by raising this extinguisher the light will be put out. *Patent abandoned.*

70. A. R. LE M. DE NORMANDY. *Improvements in fixing tubes in tube plates.* Dated Jan. 10, 1862.

This consists in passing the extremity of the tubes through plain flat plates perforated with holes somewhat larger than the said tubes, so that the two extremities of each tube may protrude a short distance through the said perforated plates. A ring (or more, if required) of vulcanised india-rubber is then stretched round the ends of the tubes which thus protrude beyond the perforated plates, so as to grip them tightly; or else a "gasket" smeared with red lead, or some other analogous material, is wound round the ends of the said tubes, and a pressing plate, that is to say, a flat plate perforated with holes also somewhat larger than the tubes, and corresponding with those of the perforated plates first-mentioned, is put over the vulcanised india-rubber rings, gasket, &c., so that the said vulcanised india-rubber rings, &c., round the said tubes, being thus situated between the flat surfaces of the tube plates and pressing plates, may, by bolting the said plates together in the usual way, be tightly squeezed between them, and thus prevent any leakage round the extremities of the said tubes, and thus obviating the necessity of using glands, collars, or "ferules," or of forcibly expanding the tubes in the tube plate as heretofore, so that when it is found necessary to replace one or more of the said tubes, it may be done simply by unbolting the two plates between which the said tubes are grasped by the vulcanised india-rubber or gasket. *Patent completed.*

71. J. CARTER. *A new or improved draining plough.* Dated Jan. 10, 1862.

The patentee claims a draining plough in which a series of balls or drags, connected with the foot of a coulter or knife, are made in combination with the said coulter or knife, to form cylindrical or pipe-like drains below the surface of the land. *Patent completed.*

72. R. JOHNSON. *An improved composition for coating the bottoms of iron ships to prevent them fouling and other purposes.* Dated Jan. 10, 1862.

This composition consists of mercurial or blue ointment (a mixture of mercury and fatty matter), arsenic, and black lead, in combination with drying oil, oil paint, or common coal tar, or black varnish. The patentee prefers to use the ingredients in about the following proportions, say, 2 lbs. by weight of the mercurial ointment, 2 lbs. by weight of powdered arsenic, with 6 lbs. by weight of black lead in powder to one gallon of coal tar, or black varnish, or paint oil, or oil paint, or other suitable vehicle, coal tar or black varnish being preferred. He thoroughly amalgamates the several ingredients by the use of a mill or pestle and mortar, or in any other convenient way. He prefers to apply this composition over a coating of common coal tar or black varnish. *Patent completed.*

73. M. WIGZELL. *An improved double-acting ventilator for railway carriages and other carriages and compartments.* Dated Jan. 10, 1862.

This consists of two chambers, with or without inner shutes of wire work or perforated divisions, for directing or dispersing the air, and for preventing the rain from entering the carriage or compartment, and it has an external opening in each chamber, so that the fresh air is admitted through one external opening into the inner space or spaces in the apertures, and then into the carriage, room, or other compartment to which it may be applied, and the hot or impure air is made to pass out from the carriage or other compartment through the outer chamber or space in the ventilator, by being assisted in its outward passage by the suction caused by the ventilator or apparatus passing through the air, or by the air rushing past the opening through which the hot or impure air passes out from the carriage or other compartment to which the ventilator is affixed. *Patent completed.*

74. J. MOORES. *Improvements in obtaining motive power.* Dated Jan. 10, 1862.

Here the inventor arranges two cisterns above a wheel, the said wheel being constructed with exterior buckets, or similar contrivances, so that, as the water descends from one of the cisterns, it gives motion to the wheel. The two cisterns may be connected by any ordinary means, each of them having a tap or other means of outlet, one to give direct motion, and the other a back motion when necessary. The said cisterns are to be filled, in the first instance, either by hand or power. He fixes on the main shaft of the said water-wheel a toothed-wheel, to work or give motion to two other toothed-wheels, each of which works a pump by means of connecting levers, the said pumps raising or lifting the water which falls from the wheel into the aforesaid cisterns, thus using the same water continuously to give motion to the wheel, which motion may be conveyed to any convenient shaft, crank, or wheel, acting as the principal prime mover. *Patent abandoned.*

75. J. OATES. *Improvements in washing machines.* Dated Jan. 10, 1862.

This consists of a tub or cylindrical vessel mounted centrally on the top of a vertical spindle or pivot, supported in a suitable framing. On the spindle is a cog wheel, into which two racks gear, one on each side of the spindle. One end of each rack is connected respectively to two hand levers, which are actuated alternately in opposite directions, thereby giving partial rotary motion to the tub or vessel. A circular lid or disc fits loosely within the tub, which is also mounted centrally on the bottom end of another vertical spindle, which is supported by a suitable fixing on a portable rail placed across the tub, but clear thereof, and attached to the framing, in which fixing the said spindle is free to rotate and slide up or down. A stud or arm is fixed in the top of the lid, at a suitable distance from the centre, to which is attached a rod connected to one of the hand levers, by the action of which partial rotary motion is given to the lid in a contrary direction to the motion of the tub. The under side of the lid, and the upper side of the tub bottom, are provided with ribs or projections. *Patent completed.*

76. H. LARVILL. *The hardening of chalk for building purposes.* Dated Jan. 10, 1862.

Here the inventor first cuts the chalk, after it has been cut into the required forms, and then immerses it, under pressure or otherwise, in a saline mineral solution; and after this has become thoroughly imbibed into the pores of the chalk, he places it in another solution capable of decomposing the first, and thereby depositing in the pores of the chalk a hard insoluble mineral chalk. He prefers to employ as the first solution either silicate of potash or silicate of soda, or tungstate of potash or tungstate of soda; and for the second solution, chloride of calcium; but he does not confine himself to the use of these salts. *Patent abandoned.*

77. W. H. PREECE. *Improved apparatus for signalling upon railways.* Dated Jan. 10, 1862.

Here the patentee proposes to assimilate the signals of telegraphic instruments to the visible hire signals used upon, and familiar to all persons on the working of, the railway. This he effects by adapting to telegraphic instruments a semaphore arm or disc, or other indicator, as the case may be, which he operates by electro-magnetic power. *Patent completed.*

78. L. PETRE and E. S. TUCKER. *The application of velvet, plush, leather, American cloth, oil-cloth, and other such like substances, alone and in combination with other materials for advertising boards, show cards, window tickets, and all such uses.* Dated Jan. 10, 1862.

Here the inventor takes velvet, plush, cloth, leather, &c., and, by a machine, or otherwise, coats the back of the fabric with a thin solution of india rubber, gutta percha, gum shellac, and other gums or adhesive substance. The material is then passed a second time through the machine, in order to increase the adhesive coating to the required thickness. The letters or devices are then cut out of the material first described, by hand or machinery, and are made to adhere by heat or otherwise to grounds, such as wood, card, oil-cloth, &c. *Patent abandoned.*

79. J. KENYON and A. HORN. *Improvements in railway signalling by electricity, and in the arrangement of apparatus for that purpose.* Dated Jan. 10, 1862.

This consists in laying down on lines of railway a system of telegraph wires and terminals, acting in conjunction with batteries of signalling apparatus carried by the trains, in such manner that each passing train shall have an indication of its presence, if within, say, two or three miles, whereby to indicate that the line is interrupted, and shall also, on exceeding that limit, remove the indication of its presence, thereby denoting the line clear to succeeding train. *Patent abandoned.*

80. W. CLARK. *Improvements in apparatus for generating and applying steam as a motive power.* (A communication.) Dated Jan. 10, 1862.

We cannot here give space to the voluminous details of this invention. *Patent completed.*

81. T. RAMSAY. *Improvements in the manufacture of coke.* Dated Jan. 11, 1862.

This consists in reducing large or small coal to the finest state of powder before converting it into coke. The patentee prefers to use such bituminous or coking coal, and he guides such coal under edge stones, horizontal stones, or rollers, to a powder. He finds horizontal stones similar to those used in grinding flour. This finely-ground coal is then put into the coke ovens and burnt in the usual way. *Patent completed.*

82. H. CHARLTON. *Improvements in the manufacture of certain kinds of shoes for mules and horses.* Dated Jan. 11, 1862.

This consists in shaping by rolling bar iron, from which shoes for horses and mules are manufactured, instead of shaping the said iron by hand forging, as is ordinary, and cutting or piercing the whole of the rectangular holes, or more than one of them, in the partially made shoes at one operation by the use of a direct acting press. *Patent completed.*

83. J. WHITE. *Improvements in lubricating, or oil cans or oil feeders, and in the mechanical arrangements for regulating the flow of oil therefrom.* Dated Jan. 11, 1862.

This relates to a can in which the movable top or cover has a top lining of leather, cork, &c., so that by temporarily securing the top, an air-tight and liquid-tight cover will be obtained. The patentee applies certain internal arrangements for regulating the flow of oil. *Patent completed.*

84. L. MACKIRDY. *Improvements in apparatus for reburning animal charcoal.* Dated Jan. 11, 1862.

This invention consists of a series of trays arranged spirally and vertically over a fire-place, or in a flue, the covers of the trays being perforated to allow of the gases evolved in the burning passing readily off from the charcoal. The trays communicate at top with a hopper, in which the charcoal to be reburnt is placed, and at bottom the trays open into a spout furnished with slides, through which the reburnt charcoal enters a closed receiver, in which the charcoal is allowed to cool without contact with the atmosphere. *Patent abandoned.*

85. T. SCOTT. *Improvements in steam-engines.* Dated Jan. 11, 1862.

This invention consists of new arrangements, hereinafter described, of combined or high and low-pressure cylinder engines. The inventor places his cylinders one over the other, that is, the small, or high-pressure cylinder over the large cylinder; or he places them side by side, according to the work the engines are intended to perform, that is, whether they are to be horizontal or vertical. The large cylinder is furnished with two piston-rods, united by a cross-head, and this cross-head by links to one end of an oscillating beam. The high-pressure cylinder has one piston rod only, and this, through a connecting rod and parallel motion, is connected to the opposite end of the oscillating beam. The ports or passages for the steam are from top to top, or from bottom to bottom, of the cylinders, and while the piston rod of the high-pressure cylinder is proceeding in one direction, the piston rods of the large cylinder move in the opposite direction, and cause the beam to vibrate or oscillate. The main connecting rod to the crank shaft is attached to the centre of the cross-head, and the power from the high-pressure cylinder is transmitted through the oscillating beam and links, and through the cross-head to the main connecting rod. *Patent completed.*

86. W. WILKINSON. *Improvements in ornamenting and decorating metals, glass, porcelain, parchment, and other skins, and in the material and ingredients employed therein; also in protecting silver and gold on said materials, and on surfaces or plates of glass and metal combined, applicable to works of art, furniture, jewellery, and other articles of a useful and ornamental character.* Dated Jan. 11, 1862.

This consists, 1, in an improved mode of protecting on or between sheets of glass, or on metals, figured designs, pictures, prints, engravings, &c., either embroidered or plain, or if necessary gilded or silvered, or otherwise ornamented, and rendered transparent or not, according to the purpose for which it is designed. 2, in gilding or silvering, or applying other metals to designs on paper and other fabrics and materials by printing the same in a lithographic or other suitable press, or by other means; and further, in ornamenting the paper and other fabrics and materials with suitable dye, colours, or inks, so as to produce an ornamental design protected by being placed upon or between plates of glass or glass and metal combined, and when thus ornamented is well adapted for pictures, windows, window blinds, pannellings to rooms, doors, ceilings, cornices, &c. *Patent abandoned.*

87. A. C. SOUTHBY. *Improvements in the preparation of pulp for paper-making.* Dated Jan. 13, 1862.

This consists in a method of washing the soluble matter from paper stuff to prepare the same for bleaching, or for the manufacture of brown paper, and consists, chiefly, in the slow and continuous percolation of water or other liquids through the paper stuff when packed into a dense mass. Also, in a method of applying bleach liquor in the preparation of pulp for paper making, such consisting, partly, in the slow and continuous percolation of bleach liquor through the paper stuff when packed into a dense mass, and partly in the use of partially exhausted bleach liquor in commencing the process of bleaching. Also, in a method of washing out of paper stuff, after it has undergone the process of bleaching, the bleach liquor and the colouring matters which have been rendered (by the application of the same) soluble in water, or in solutions of alkalies or acids, such method consisting chiefly in the slow and continuous percolation of water or solutions of alkalies or acids through the paper stuff when packed in a dense mass, and after it has undergone the improved method of bleaching above described, or any other method of bleaching. *Patent abandoned.*

88. J. M. ROWAN. *Improvements in the manufacture of iron and steel.* Dated Jan. 13, 1862.

This consists of improved modes or means of introducing into fluid iron for the purpose of removing such impurities as sulphur, phosphorus, and silica, gaseous matters, such as chlorine, hydro fluoric acid, and others, depending on the particular action desiderated. And in carrying out the invention the said gases, being produced in any convenient manner in separate receivers, are afterwards made to enter the melted metal by being forced in after their production by means of pumps or other suitable means, or by being produced in closed vessels in such a way as to have the pressure requisite for their introduction into the melted metal. *Patent abandoned.*

89. T. and C. GILBERT and T. HADDON. *An improvement or improvements in the manufacture of swivels for guns and in machinery to be employed in the said manufacture.* Dated Jan. 13, 1862.

The patentee claims, 1, making the blanks from which the said swivels are made by forming a knob or head on each end of a rod of iron, or a piece of iron, by upsetting or compressing a portion of the ends of the said rod or wire in the direction of its length, from which knobs or heads the flat disc-like ends of the services are formed; 2, the machinery or tools described (with reference to the drawings) for upsetting or compressing the ends of the rod of iron, or piece of iron-wire, so as thereby to manufacture swivel-blanks. *Patent completed.*

90. F. C. WARLICH. *Improvements in the manufacture of artificial fuel.* Dated Jan. 13, 1862.

The patentee claims, 1, the application of the gases evolved during the distillation of coal to the heating of carbonizing ovens, in which block-fuel is subsequently baked; 2, the application of the gases evolved during the torrefication of coal to the heating of the torrefiers, retorts, and carbonising ovens; 3, the collection of coal-tar and other distillates during the process of torrefying bituminous coal for the manufacture of black fuel. *Patent completed.*

91. T. and M. SOAR and J. BELSHAW. *An improved knocker to be attached to doors, shutters, or other parts of premises to which the same may be applicable, and applicable also for the reception of letters and other documents.* Dated Jan. 13, 1862.

This consists of an arrangement and combination of apparatus in which is used a plain or ornamental plate of cast iron or other metal or material, the upper end of which is made in the form of a label or scroll, upon which a name or number may be engraved, or otherwise delineated. Below the label or scroll is a stud or studs, which forms or form part of the hinge of the knocker, and which is secured to it by a pin or rivet. The back of the knocker forms a plug and rivet, which closes a slit in the plate lying below the stud. Below this slit is a projection near the bottom or lower end of the plate, upon which the knocker falls; and, where required, a hole may be drilled through the projection, and a wire passed through it, having one end tapped and screwed into the lower end of the knocker; in which case, when the knocker is raised for inserting a letter or other document, it will, besides knocking the door, also ring a bell, the other end of the wire being connected to another wire or lever for that purpose. A receptacle for the letters or other documents may be added, the same being composed of wood or suitable material. *Patent completed.*

92. J. PARKER and J. and B. WELLS. *Improvements in steam-engines, boilers, furnaces, and apparatus in connection therewith or applicable thereto.* Dated Jan. 13, 1862.

The specification of this invention comprises novel arrangements for effecting a more efficient force of steam when applied as a motive power, and for economising the working of steam-engines, thereby effecting a saving of fuel, and a better combustion of the gases. We cannot here give the details. *Patent completed.*

93. W. E. GEDGE. *Improved means or apparatus for gaining or acquiring motive power.* (A communication.) Dated Jan. 13, 1862.

This consists of a trough partially filled with water. In this trough is made to rotate (by cog-wheels and pinions, pulleys, or any suitable gearing), a wooden or metal drum or cylinder, supported on a horizontal shaft, and having on its outer surface a number of sacks or pockets (of leather, caoutchouc, or some woven or other suitable fabric), into each of which enters a couple of tubes, the other ends of which are socketed on the drum, and provided with a small toothed wheel, the rotation of which opens or shuts a tap placed in the tube accordingly as the motion sets in one direction or the other. As the drum rotates, it works a pair of bellows, injecting into each pocket, as it passes beneath the water, sufficient air to fill and swell it out, giving it a tendency to rise to the surface of the liquid, where the air is permitted to escape, and the pocket collapses to be again inflated, when, by the continued rotation of the drum, it again passes beneath the water. It will be readily understood that the pocket, being filled with air when under water, naturally endeavours to rise to the surface of the liquid, and thus cause the drum to continue its rotation at more or less speed. *Patent abandoned.*

94. F. W. MARX. *Improvements in the manufacture of cups, bowls, saucers, and other dished articles and cases.* (A communication.) Dated Jan. 13, 1862.

This invention consists in manufacturing cups, bowls, saucers, and other dished articles, as also cases of leather, velvet, silk, and other like materials, as hereafter described. The inventor cuts out from a skin or other material two discs, and, if desired, cements a figure on the back of each of the discs, paper, muslin, cloth, or other strengthening material. He applies a stiffening agent, such as shellac. Each of the discs, alone or strengthened, is afterwards stamped in relief, or in intaglio, with any pattern desired; the two discs thus prepared are placed over or one within another, and the edges are closed and ornamented by a metal moulding or not, according to the nature of the article. For cases the stamped discs are superposed and united by a hinge at back and snap in front. *Patent completed.*

95. HENRY SCHOTTLANDER. *Improvements in albums for containing photographic and other pictures.* Dated Jan. 13, 1862.

This invention consists in so forming the leaves of albums that the picture or pictures, together with part of the leaf holding the same, may be placed and held at an inclination, so as to obtain the most suitable light for viewing the pictures. The inventor applies on each side of every leaf, or on one side only, a frame for holding one or two pictures, and unites it at one side or end only; and he makes a tongue or frame in or on the holding frame. When the album is closed, or when the leaves and pictures are in their ordinary position, the holding frames, pictures, and tongues do not protrude beyond the thickness of the leaves. When the album is opened, and any picture is to be viewed, the holding frame is raised, and the tongue or back frame is protruded outwards, and the frame, resting partly upon it, is maintained inclined. If desired, pictures may be held in the leaves which are covered by the holding frames, and which can only be seen when such frames are raised. Again, instead of the tongue or supporting frame before mentioned, he sometimes forms the support by bringing a piece of cardboard or other suitable material to the top of the holding-frame, which is pushed outwards for supporting the holding-frame, and which is folded inwards and under the holding-frame, when the pictures are not required to be raised to be viewed. *Patent abandoned.*

PROVISIONAL PROTECTIONS.

Dated March 11, 1862.

652. J. Nadal, mechanist, 14, Brook's Market, Holborn. An improved portable fountain for water or other liquids.

Dated March 17, 1862.

728. A. S. and A. R. Stocker, Wolverhampton, manufacturers. Improvements in the manufacture and construction of metal boot heels and tips and horse shoes.

Dated March 31, 1862.

887. M. A. F. Mennons, 39, Rue de l'Echiquier, Paris. Improvements in the manufacture from vegetable product of glucose or fermentable sugar. (A communication.)

Dated April 14, 1862.

1074. R. A. Brooman, 166, Fleet Street, patent agent. Improvements in carriages for transporting loads on railways, common roads, and other surfaces. (A communication.)

Dated May 20, 1862.

1520. M. A. F. Mennons, 24, Rue du Mont Thabor, Paris. Improved processes for the conversion of amylaceous matters into saccharine and other useful products. (A communication.)

Dated May 22, 1862.

1541. J. H. Perry, 72, Piccadilly, gentleman. An improved method of curing diseases of the human body by magnetism.

Dated May 29, 1862.

1612. P. Boisset and B. Antognini, New York. Improvements in the manufacture of boots and shoes.

1613. H. Boetius, Great George Street, C.E. A new mode of cooling (refrigerating) hot liquids, and condensing steam.

Dated June 3, 1862.

1669. T. L. Scowen, Allen Road, Stoke Newington. Improvements in indicating time and accent in music.

Dated June 5, 1862.

1693. J. E. Moiroux, Windmill Street, Tottenham Court Road. A new compound for protecting and preserving the polish, polished, and other surfaces of metals, woods, skins, and paper, and for rendering all woven, textile, and other fabrics water and weather proof

Dated June 11, 1862.

1734. J. Shand and S. Mason, engineers, 245, Blackfriars Road. Improvements in the construction of steam boilers.

1738. W. Holland, Adelphi Mills, Salford, cotton spinner. Certain improvements in carding engines.

Dated June 12, 1862.

1751. H. S. Firman and W. J. Williams, 73, Great Suffolk Street, Southwark. Improvements in lamps, more particularly designed for burning paraffine or coal oil and other hydro carbons of different grades, or any combustible material used for obtaining light. (A communication.)

Dated June 16, 1862.

1777. C. E. Courtillier, 184, Boulevart Magenta, Paris, physician. Improved inhaling and saturating apparatus.

1779. J. F. Allan, ironfounder, Glasgow. Improved furnace arrangements to prevent smoke and economise fuel.

1781. J. Evans, Hyde, Cheshire, overlooker. Improvements in self-acting mules.

1783. H. Bright, Woodford, Essex, gentleman. Improved apparatus or arrangements for screening fires in stoves and grates with the view to avoid accidents.

Dated June 17, 1862.

1785. S. H. Huntly, 50, Upper Baker Street, Regent's Park. Improvements in the construction of furnaces for effecting the more perfect combustion of the fuel.

1786. A. Crestadoro, 19, Great Ormond Street, Queen Square. Improvements in obtaining and applying motive power from rarefied air and from aeriform fluids.

1787. J. Hunt, Birmingham, brassfounder. An improvement or improvements in bronzing or colouring articles of copper or alloys of copper.

1789. A. W. Makinson, Westminster, C.E. Improvements in locomotive and stationary engines.

1791. A. Pringle, Gloucester Crescent, Camden Town. Certain improvements in locks.

1793. S. Varley, Sleaford, Lincolnshire, engineer. Improvements in reaping machines.

Dated June 18, 1862.

1799. J. Warren, Maldon, Essex, implement manufacturer. Improvements in ploughs.

1801. W. E. Newton, 66, Chancery Lane, C.E. Improvements in electrical brushes. (A communication.)

Dated June 19, 1862.

1803. J. L. Smith, 18, St. John's Square, Clerkenwell, clock manufacturer. A universal fire alarum with discharging apparatus.

Dated June 25, 1862.

1865. A. Bayley, Liverpool, oil merchant. Improvements in lamps.

Dated June 26, 1862.

1875. T. R. Tebbutt, Manchester, soap manufacturer. Certain improvements in the manufacture of soap, soda, and other material employed for the purpose of washing and cleansing.

1877. J. B. Coquatrix, Rue Folie Mericourt, Paris. Improvements in weaving carpets, tapestry, and similar fabrics, and in apparatus for the same.

1879. J. H. Johnson, 47, Lincoln's Inn Fields, gentleman. Improvements in the construction of electro-voltaic plate work for medical and other purposes. (A communication.)

1880. J. H. Johnson, 47, Lincoln's Inn Fields, gentleman. A new composite fluid to be used for illuminating purposes. (A communication.)

Dated June 27, 1862.

1881. A. Anderson, blacksmith, St. John's, New Brunswick. Improvements in apparatus for steering ships or other vessels.

1882. J. Watson, 10, Old Bailey, City, printer. Improvements in printing machines and apparatus connected therewith for printing from letter-press forms.

1883. C. Cochrane, Ormesby Iron Works, Middlesbro'-on-Tees. Improvements in the manufacture of aluminate of soda and potash.

1885. C. Cochrane, Ormesby Iron Works, Middlesbro'-on-Tees. Improvements in the manufacture of iron.

1887. W. Owen, Coventry, designer. The manufacture of woven tickets of silk, cotton, or wool, or mixture of those materials, for the purpose of marking or advertising goods.

1889. A. H. Martin, Buttershaw, near Bradford, Yorkshire, mechanic. Improvements in means or apparatus employed in weaving.

1890. I. Holden, Bradford, Yorkshire, machine wool comber. Improvements in means or apparatus for preparing and combing wool and other fibrous materials.

1891. A. A. Croll, Coleman Street, City, engineer. Improvements in the treatment of ammoniacal liquor of gas works.

1892. D. L. Banks, engineer, 17, Gracechurch Street. A new method of constructing a portablecovered coffer dam or apparatus for facilitating operations under the water, in the water, or out of the water, and apparatus connected therewith.

1893. D. L. Banks, engineer, 17, Gracechurch Street. A method of constructing a portable sectional dry dock, and apparatus connected therewith.

Dated June 28, 1862.

1895. T. King, Grafton, Warwickshire, farmer, and John King, Chadshunt, Warwickshire, farmer. Improvements in agricultural machines.

1896. C. Beslay, Rue Menilmontant, Paris, gentleman. Improvements in galvanizing or coating metals by electro-chemical agency, and in apparatus connected therewith.

1899. G. W. Belding, 7, King Street, Cheapside. An improved flexible-spring cloth or fabric especially adapted for the manufacture of ladies' skirts.

1900. C. Callebaut, 2, Rue Ste. Appoline, Paris. Certain improvements in sewing machines.

1901. J. Tatham, Rochdale, machine maker. Improvements in machinery or apparatus for preparing, spinning, doubling, and winding cotton, wool, and other fibrous materials.

1903. J. Webster, 142, Woodbridge Road, Ipswich. Improvements in the means of protecting steam boilers from incrustation.

Dated June 30, 1862.

1905. J. Wall, Liverpool, plumber, and T. Dodd, Liverpool, glass merchant. Improvements in taps for controlling the flow or passage of fluids.

1906. W. Thomas, Liverpool, carriage builder. Improvements in the running gear of four-wheeled carriages.

1907. J. Hartshorn, Mansfield Road, Nottingham, lace manufacturer. Improvements in the manufacture of lace.

1908. A. Byrnes, 5, Metropolitan Buildings, Mile End New Town, gun maker. Improvements in breech-loading fire-arms.

1909. W. E. Gedge, 11, Wellington Street, Strand. Improvements in looms for weaving. (A communication.)

1911. W. E. Newton, 66, Chancery Lane, C.E. Improved apparatus for picking or gathering cotton. (A communication.)

1913. T. Parker, Woodhouse Carrs, Leeds, dyer and stover. Improvements in tinting or dyeing fabrics composed of mixed animal and vegetable fibres.

Dated July 1, 1862.

1917. R. A. Brooman, 166, Fleet Street, patent agent. Improvements in the construction of blast furnaces. (A communication.)

1919. G. H. Birkbeck, 34, Southampton Buildings, Chancery Lane, engineer. Improvements in processes for the utilisation of certain refuse products resulting from the manufacture of iron, such processes being applicable to the treatment of other metallic or mineral substances. (A communication.)

1920. J. Greenhalgh, Hyde, Lancashire, mechanic, and J. Greenhalgh, Audenshaw, farmer. An improved diminishing valve, and also a water or steam escape apparatus to give alarm in case of fire, and to assist in quenching the same.

1921. T. Fellowes and H. Hemfrey, Spalding. Improvements in apparatus for elevating straw and other agricultural produce.

1923. W. E. Newton, 66, Chancery Lane, C.E. Improved machinery for washing wool. (A communication.)

Dated July 2, 1862.

1924. E. De Labastido, 43, Hart Street, Bloomsbury. A new method of manufacturing india-rubber articles by the simultaneous combination of pressure and vulcanisation. (A communication.)

1925. W. Porter, Fleetwood. Improvements in the manufacture of targets.

1927. J. Ellerbeck, Heywood, manufacturer. Improvements in looms for weaving.

1929. T. L. Atkinson, Stamford Street, Blackfriars Road, wharfinger. Improvements in the construction of stew pans and other such like cooking utensils.

1930. G. H. Hulskamp, Troy, New York, piano forte maker. Improvements in violins and other similar stringed instruments, and in guitars.

1931. J. Murray, Whitehall Place, solicitor. Improvements in portmanteaus.

1933. J. Crisp and J. W. Elliott, East King Street, South Shields. Improvements in apparatus for burning American rock oil, paraffine oil, oil of petroleum, and other inflammable oils, spirits, or essences.

1935. G. Bedson, Manchester, manager. Improvements in rolling wire and other rods or bars of metal.

Dated July 3, 1862.

1941. T. Edmunds, Seymour Place, Bryanstone Square, grocer. Improvements in preparing compressed fruits in cakes.

1943. J. Miles, Street, near Glastonbury, Somersetshire. Improvements in machinery for cutting out soles and other parts used in the manufacture of boots and shoes, and also parts used in the manufacture of other articles.

Dated July 4, 1862.

1944. S. Russell, 27, Shaftesbury Crescent, Pimlico. Improvements in stereoscopes.

1945. W. J. Cunningham, Everett Terrace, Victoria Dock Road, Essex, outfitter. Improvements in sewing machines.

1946. A. Drevelle, Manchester, merchant. Improvements in machinery or apparatus for laying cards or sheets of metal into woven or textile fabrics ready for the press, and also for folding, measuring, or stretching the said fabrics, paper, and other materials.

1947. S. Whitham, Wakefield, iron manufacturer. Improvements in the manufacture of iron and steel, and in the apparatus employed for that purpose. (A communication.)

Dated July 5, 1862.

1949. H. Rushton, 48A, Northampton Road, Clerkenwell. Improvements in covering crinoline steels.

1950. R. A. Brooman, 166, Fleet Street. Improvements in hollow plates for hydraulic presses. (A communication.)

1951. O. F. Byström, Stockholm, captain of artillery. An improved pyrometer.

1952. C. G. Hill, Commerce Square, High Pavement, Nottingham, lace manufacturer, and W. Jackson, engineer. Improvements in machinery or apparatus for producing ornamental patterns or figures and attaching them to lace or other fabrics.

1952. A. Warner, 31, Threadneedle Street. Improvements in preparing materials for and in purifying coal gas.

Dated July 7, 1862.

1957. T. Edwards, Liverpool, gas engineer. Improved movement for the indices for gas, water, and other fluid meters.

1959. J. P. Booth, Cork, feather purifier. Improvements in the manufacture of feather beds, quilts, bolsters and pillows.

Dated July 8, 1862.

1960. W. Spence, 50, Chancery Lane. Improvements in telegraphic apparatus. (A communication.)

1962. C. B. Gruner, 25, Alfred Street, River Terrace, Islington. Improvements in photographic apparatus.

1968. J Bourke, Her Majesty's 29th Regiment of Foot, Curraghleagh, Clanmorris, Ireland. Improvements in military accoutrements.

Dated July 9, 1862.

1972. T. C. Gibson, Ramsey, Isle of Man, ship builder. Improvements in the construction of ships and vessels for the purpose of carrying and warehousing petroleum, palm oil, and other oils or inflammable fluids.

1974. H. S. Pontifex, Banbury, brewer. Improvements in apparatus for distributing water applicable to cleansing casks or other vessels, or for other purposes.

1976. C. F. W. Rust, London Wall, merchant. Improvements in concertinas and other wind instruments of that class. (A communication.)

1980. T. Green, Smithfield Iron Works, Leeds, and R. Mathers, 2, Victoria Street, City. Improvements in steam boilers.

1982. J. O. Butler, Kirkstall Forge Company, near Leeds, engineer. Improvements in steam hammers and in framings therefor.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1971. J. M. Gille, 24, Rue du Mont-Thabor, Paris, Knight of the Imperial Legion of Honour. An improved calendar inkstand. *Dated July* 9, 1862.

1990. E. Townsend, Massachusetts, U.S. A new and useful invention for making nails, and driving such nails into the sole of a boot or shoe. (A communication.) *Dated July* 10, 1862.

2006. M. A. F. Mennons, 24, Rue du Mont-Thabor, Paris. Certain improvements in vessels mounted as floating batteries. (A communication.) *Dated July* 12, 1862.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

612. J. Fowler, D. Greig, and R. Noddings. Cultivating or tilling land.
619. A. W. Williamson. Generating steam.
633. F. N. Gisborne and H. Wickens. Indicating the presence of fire damp or choke damp in mines.
648. J. T. Callow. Mining or lifting machines.
652. J. Nadal. Portable fountain.
658. C. Hall. Cultivation of the soil by steam.
670. J. Johnson and S. Morris. Steam boilers.
671. W. Conyers. Currying leather.
674. A. M. A'Beckett. Railway signal apparatus.
691. M. Henry. Stuffing boxes. (A communication.)
692. R. A. Brooman Measuring and regulating the flow and pressure of gas. (A communication.)
699. R. Schomberg and A. Baldamus. Purifying illuminating gas.
704. G. Bennett. Coating and covering wrought iron.
705. G. H. Sanborn. Gas regulators. (A communication.)
706. L. Gabler and M. Zingler. Manufacturing articles from ivory and bone.
708. A. J. Paterson. Electric telegraph cables.
709. M. A. Muir and J. McIlwhain. Railway sleepers and chairs.
711. A. and W. Coles. Trusses for cases of hernia.
714. C. N. Kottula. Manufacture of combined soaps.
715. G. B. Pettit. Heating water and other liquids.
716. J. Smadja. Bustles and crinolines.
718. J. Hunter and R. Scott. Reaping machines.
721. S. N. de la Haye de Barbezière. Horse shoe.
723. G. Hamilton. Tumbler locks.
724. J. Robey. Manufacturing and refining sugar.
725. W. Pickstone. Manufacture of piled fabrics.
728. A. S. and A. R. Stocker. Manufacture and construction of metal boot heels and tips and horse shoes.
730. W. B. Lord and F. H. Gilbart. Raising, lowering, and releasing ships' boats or other heavy bodies.
734. J. and W. Weems. Regulating the discharge of fluids.
738. G. T. Bousfield. Cranks. (A communication.)
746. M. A. Mennons. Cooling and filtering apparatus. (A communication.)
758. S. Slack. Manufacture of stockings in knitting machines.
762. A. Krupp. Shafts.
765. R. Wilson. Hydraulic machinery and processes.
766. S. Moore. Compressing and cutting tobacco.
782. D. E. Siebe. Refrigerating.
783. R. Kay. Printing calico
786. J. M. Hart and R. Lavender. Generating steam.
793. D. Abercrombie. Power looms.
805. W. Holiday. Press plates.
807. M. Henry. Kilns, ovens, and furnaces. (A communication.)
808. J. H. Brierley. Clasp.
828. W. Clissold. Carding engines.
833. J. Parker. Steam Engines. (A communication.)
836. R. Boby. Hay-making machines.
886. J. Clinton. Flutes.
908. W. Clark. Manufacture of manure. (A communication.)
924. The Rev. G. Scratton. Shades or blinds.
934. W. Clark. Apparatus for manifold writing. (A communication.)
936. W. Clark. Manufacture of carbonic acid. (A communication.)
1017. W. E. Newton. Raising and forcing water and other liquids. (A communication.)
1074. R. A. Brooman. Carriages. (A communication.)
1089. W. Clark. Ornamenting fabrics and other surfaces. (A communication.)
1107. W. E. Newton. Setting artificial teeth. (A communication.)
1152. J. Combe. Hackling flax and other fibrous substances.
1381 C. Lungley. Manœuvring ships and vessels.
1402. J. F. Millward. Breech-loading fire-arms. (A communication.)
1488. G. Davies. Manufacture of ribs for umbrellas.
1757. A. Longbottom. Manufacture of artificial stone.
1857. E. C. Nicholson. Preparation of colouring matters.
1879. J. H. Johnson. Electro voltaic plate work. (A communication.)
1896. C. Beslay. Coating metals by electro chemical agency.
1906. W. Thomas. Running gear of four-wheel carriages.
1908. A. Byrnes. Breech-loading fire-arms.
1990. E. Townsend. Making nails. (A communication.)

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed July 18, 1862.

158. A. J. Martin.
159. R. A. Brooman.
160. W. Burgess.
165. F. W. Gerish.
166. E. Pace.
178. A. Ripley.
184. W. Clark.
185. J. Longhurst.
195. J. C. F. Mougin.
235. W. Clark.
246. E. A. Rippingille.
250. W. Clark.
259. W. Walton and F. Walton.
276. T. Cook.
279. W. Clark.
283. D. Joy.
291. C. M. Roullier.
316. M. Henry.
338. M. A. F. Mennons.
650. H. H. Kromschweder.
759. F. Warner.
1003. J. Lawson.
1012. W. Davies.
1015. C. Mather.
1113. J. W. Ford.

Sealed July 22, 1862.

188. T. Morris, R. Wear, and E. H. C. Monckton.
189. C. G. Hall.
194. C. West.
197. D. Edleston and H. Gledhill.
198. E. A. Curley.
200. F. J. L. Lefort.
202. J. Brown and J. Davenport.
207. R. Martindale.
208. C. W. Harrison.
214. H. H. Treppas.
222. S. C. Lister and J. Warburton.
238. B. Foster and J. Moore
242. M. Collier.
244. M. Allen.
245. T. Gontard.
247. J. Firth.
352. A. Lahousse.
353. D. Littlehales.
896. R. Burley.
922. W. C. Harrison and H. J. Standley.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1633. J. H. Johnson.
1629. D. and T.R.H. Fisken
1640. H. D. P. Cunningham.

PATENTS ON WHICH THE SEVENTH YEAR'S STAMP DUTY HAS BEEN PAID.

1684. H. Cunnew.
1724. J. Broadley.
1738. J. Gillott.

LIST OF SPECIFICATIONS PUBLISHED.

During the Week ending July 19, 1862.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s. d.		s. d.		s. d		s. d.		s. d.		s. d.
3091	0 3	3103	0 5	3115	0 7	3127	0 10	3139	0 3	3151	0 6
3092	0 3	3104	0 3	3116	0 3	3128	0 3	3140	1 5	3152	0 6
3093	0 7	3105	0 3	3117	0 7	3129	0 6	3141	0 7	3153	0 3
3094	0 6	3106	0 3	3118	1 4	3130	1 1	3142	0 10	3154	0 5
3095	0 3	3107	0 3	3119	0 5	3131	0 3	3143	0 9	251*	0 3
3096	0 10	3108	1 5	3120	0 10	3132	0 3	3144	0 3	...	...
3097	0 3	3109	0 5	3121	0 3	3133	0 6	3145	0 3	...	...
3098	0 10	3110	1 5	3122	0 3	3134	0 3	3146	0 6	...	..
3099	0 5	3111	0 3	3123	1 1	3135	0 10	3147	0 5	...	...
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3101	0 5	3113	0 6	3125	0 3	3137	0 9	3149	0 3	...	...
3102	0 3	3114	0 5	3126	0 8	3138	0 3	3150	0 3	...	...

* Disclaimer and Memorandum of Alteration.

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5*s.* must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, AUGUST 1, 1862.

REVOLVING TOWER AND COAST DEFENCES.

What a waking up of public feeling there has been on coast defences since we first aroused attention to the subject! The revolution in naval warfare, resulting from the science of fortification with iron plates, is comprehended by all classes. Two first Lords of the Admiralty vie with each other to announce in the House of Lords those truths which we did our best to inculcate some months ago. The *Times*, moved by this circumstance, is struck with astonishment at the course of the debate in the House of Lords on Friday last, which it designates as "in every respect worthy of the "reputation of that great assembly." The leading journal has been terribly at fault on the armour-plate question, having to steer a middle course between the advocacy of the Armstrong Gun and the Warrior Target. The unhappy reporter who does the naval and military intelligence had a difficult task. If the target resisted the gun, Sir William's fortunes hung in the balance; if the gun prevailed, the Controller of the Navy was driven to despair: hence arose the contradictory statements published in the *Times*, of the results of Target trials, which were extolled as *graphic* by the gallant Secretary of the Admiralty. At last, on that unlucky day when the Minotaur target and the gun both broke down, the truth was suddenly revealed, and the mystification long kept up was swept away.

Armour plating and naval guns, which, combined, are the elements of impregnable ships, have acquired their fixed position of paramount importance, and, warned by the voice of authority, even the *Times* is casting off its reserve, and preparing to admit that there may be better guns than the Armstrong, and better systems of armour-plating than the Warrior's.

On the authority of the Earl of Ellenborough, who spoke out with his usual manly independence, and was corroborated by the Duke of Somerset, the *great fact* we long since published is incontestably announced to the people of England, that "the superiority in "iron-clad ships is now the superiority on sea; "therefore it is essential that we should have "the superiority in iron ships, in order to "recover our superiority on sea, on which our "existence as a first-class power depends."

Impressed with this idea, we lately visited the Naval Arsenal of the International Exhibition, which affords a wide field of instruction on the absorbing subject of the maintenance of our national independence. We contemplated the representatives of the argosies of our forefathers, the fighting ships of the two last generations, and the splendid screw steamers of a few years back with a sigh for their departed glories—as things swallowed up for ever in the vortex of improvement, and we fixed our contemplation on the beautiful model of the Northumberland, and the series of models and drawings, including sections of Captain Cole's cupola ship, as the representatives of the new system of naval warfare, which has entirely superseded the old. We had in our mind the exploits of the Merrimac and the Monitor and the experiments on armour-plated targets at Shoeburyness. Two prominent facts forced themselves on our attention. In a naval combat between the Northumberland or a cupola ship and an invulnerable iron-clad enemy, on the one hand, the terrific effect of horizontal shell firing would speedily cut down everything above the upper deck of the Northumberland, making masts, and spars, and rigging a wreck, with which she would be encumbered, and every man on that deck would be killed or driven below; whilst, on the other hand, the crew of the cupola ship would be unable to remain on the upper deck; and thus, in both cases, the men would be confined within the iron walls of the armour plates. Taking this view, which can hardly be controverted, the advantage of the cupola system is not apparent, but, on the contrary, it offers great disadvantages. The men are cribbed, cabined, and confined; only a limited number to fight the guns could be admitted into the towers, and the rest would be condemned to inaction. The means of boarding an enemy or repelling boarders from a cupola ship without masts or spars, and without ready means of emerging from below on to the upper deck, are extremely restricted, so that at close quarters she would be at a great disadvantage; and it seems that if a number of the enemy had got possession of the deck, they might use mechanical appliances to impede the rotation of the towers, and throw hand grenades or other explosive preparations into the furnace chimney and the openings in the towers, to the great damage of the crew confined below. On board the Northumberland the case would be different. The men could swarm up the hatchway or retire rapidly, either to board an enemy alongside, or to repel a boarding party, or retreat from a sweeping fire. All these movements could be made with alacrity, and the men would have a sense of independent power of action very different from the depressing sensation which the confinement in the bowels of a cupola ship would engender in their minds. If the armour plating of the sides of the Northumberland were shot proof, she would fight an enemy with infinitely greater power and effect than the cupola ship could do. The training of the guns in the latter will depend entirely on machinery, which will be liable to get out of order, and the tower itself may be jammed by the enemy's fire. On reflection, we fear it will be found that the revolving tower system is a mistake, which is founded on the assumed difficulty of making the sides of a ship invulnerable. We have no wish to underrate Captain Cole's ingenious invention, or in the slightest degree to depreciate his merit, but we have to consider which is the best mode of constructing floating defences, and we are of opinion that much still remains to be learnt. We next come to the Monitor arrangement, which appears to differ so little from Captain Cole's plan, of which it is even said to be an imitation, that the objections to one are applicable to the other; and certainly the chances of this class of battery, with only one tower and two guns, are not in its favour, whilst the action of its crew on the upper deck, either to board or resist boarders, would be extremely restricted.

In our last number a description and drawings appeared of another class of revolving tower ship, the invention of Mr. Walker, who is a practical and able engineer. He has himself explained his plan, of which the peculiar feature is that the tower floats on water, and, as he states, will revolve easily; but he does not show how the power to put it in motion is applied. He proposes that his tower should be twenty to thirty feet in diameter, and be armed with five to ten guns, which are to be brought to bear successively, and fired one by one, which he says may be done with great rapidity. He may be right in that particular, but his system precludes broadsides, the mode of firing which, in naval warfare, is the most destructive.

The invulnerable floating battery for efficient harbour defence, as we understand it, has yet to be invented. None of the contrivances of English or foreign inventors, including those which have issued from the prolific brain of American engineers, come up to the ideal of a floating fortress, which should be irresistible when opposed to iron-clad vessels constructed for sea-going purposes. To the production of stupendous engines of naval warfare, which shall carry guns and armour plates far too heavy for the protection or armament of cruisers, the engineering science of the country is directed; and the time, we are persuaded, is not far distant when structures of that description will form our chief maritime coast defence.

On the score of expense, when comparing advanced forts with floating batteries, it is ludicrous to hear the Government organs in Parliament and the press, who are loudly clamouring for a boundless expenditure on inland fortifications, cavilling whether fixed forts or floating batteries will cost most to erect and maintain. The question is, not the price, but which is the right thing? If the floating defence is the right thing, we should like these penny wise and pound foolish economists to inform us why, if our "existence as a first-class power" demand the expenditure of sums varying from 300,000*l.* to 500,000*l.* for the creation of each one of such sea-going men-of-war as the Warrior, Achilles, and Minotaur, the same all-powerful reason does not justify the expenditure of similar sums for the right class of permanent and stationary defences to those vast naval workshops where the iron walls on which our national existence depends are constructed.

About harbour defences there is misapprehension on both sides. As usual in most controversies, each party is too eager to maintain its own argument to accept that of its opponent. The land-defence advocates take no account of sea defences, and the partisans of floating defences depreciate land forts. Both are wrong in confining themselves too exclusively to one view, but there is more sense and more sincerity in the latter. They distinguish between forts for defence on the land side and forts for defence on the sea side—two distinct propositions, which the land-forts advocates ignorantly or purposely confound. As supporters of floating batteries, amongst whom we desire to be foremost, we will reduce the question to its simple expression by two propositions:

1. At the present moment, which object is the most urgent, the defence of our harbours on the side of the land or on the side of the sea?

2. For advanced defences at the entrance of a wide sea channel, as at Spithead, are fixed forts or floating batteries most efficient?

We do not deny the utility of fortifications on the land side, but we say the urgency of providing defences on the sea side is greater: it is, in fact, paramount, and admits of no delay. Clearly, inland defences will be of no avail, except in the contingency of inland attack, which must be preceded by a landing. This contingency is possible, but the enterprise is difficult and unlikely; and, if we maintain the supremacy on the sea, the danger is remote. But now that invulnerable ships are brought into existence, and vertical fire at long range is a certain means of offence, the sudden attack of a naval arsenal is not difficult or improbable;

indeed, it is a risk to which every harbour in the empire within bombarding distance from the sea would be exposed in case of war. To transport and land on our coast, and march inland an army provided with cavalry, artillery, ammunition, and stores, of sufficient force to overcome our army in the field, and make an attack on our harbours on the land side, would be a vast and daring operation. We are not contending that such an enterprise is impossible, but it would be the height of rashness on the part of the invader, and certainly is a remote danger. But when we turn to the other side, the case is different. With a few invulnerable iron-cased ships—some of those American monsters, of which a powerful fleet will be afloat before the end of this year, would answer the purpose—an enemy might make a sudden raid on Portsmouth, and, if we had not got ships equally invulnerable ready to oppose the invaders, the attack could not be resisted. Your inland forts would be of no avail; the enemy would steam into Portsmouth harbour, and, with impunity, destroy your shipping and arsenals, and levy a contribution to save the town from bombardment. This is a likely event, and Ministers will be traitors to the country if they do not guard against it.

Well may Lord Ellenborough express his amazement at the supineness of the Admiralty in the following words:—"The opposition to "the Spithead forts was made on the ground "that iron ships would afford us better protec- "tion, but we have given over the forts and "we have not heard of the iron ships. The "patriotic gentlemen who were anxious to have "iron ships in preference to forts, must feel "disappointed when they find that, though "the latter have been given up in the case of "Spithead, there is no additional grant asked, "for what they propose as a substitute."

Fortunately, the reply of the Duke of Somerset offers some consolation to the country. He announced that he had not spent all the money "voted last year for iron-clad ships, "and he therefore did not think it necessary "to ask Parliament for more money for that "purpose." We may, therefore, hope, now that the attention of Government is awakened to the urgent necessity of protecting our harbours on the side of the sea, and fixed forts are condemned, proper encouragement will be given to proposals for the construction of powerful and efficient floating batteries.

THE GOLD COINAGE OF AUSTRALIA.

It is with no small amount of gratification that we record the fact of a select committee of the House of Commons having last week reported in favour of legalising, and, indeed, of imperialising, the gold coinage of Australia. The utter absurdity of the arrangement which permitted the establishment of a Branch Mint in Sydney, and yet limited the circulation of coin emanating from its presses to the colonies of Australia, has repeatedly been exposed in our columns; and it is a legitimate source of pleasure, therefore, to find our views now completely endorsed by Parliamentary authority. The report of the committee is published, and it is desirable, perhaps, to point out some of the reasons which have induced its members to come to the conclusions at which we had long since arrived.

The first witness examined was Mr. Thomas Graham, F.R.S., Master of Her Majesty's Mint, and his evidence, which is at once clear and convincing, went to show the existing regulations in reference to the Sydney Mint, and the evils arising from them. Without following Mr. Graham through the minute details into which he felt it necessary to enter, it may not be irrelevant to give an abstract of his testimony. From his statement, then, it appears that, in consonance with an Order in Council of the year previous, the Branch Mint of Sydney went into operation in May, 1855. The officers of the establishment are appointed by the Lords Commissioners of the Treasury, and sovereigns and half-sovereigns are the only coins stamped thereat. The Sydney Mint does not entail any charges on the imperial funds, the entire cost of its original establishment, and the annual salaries and contingencies of the department, being defrayed by the Colonial Treasury of New South Wales. To meet this expenditure, a charge is made on all gold brought to the Mint, whether for coinage or for melting, assaying, or running into bars, the same amount being levied for either process. The charge for these operations, according to the last published regulations, is equal to three-quarter per cent. upon the parcels of gold introduced. The mode of insuring payment from fortunate diggers, and others who avail themselves of the assistance of the Mint, is rather remarkable, and betokens something like "sharp practice" on the part of the officials. For instance, in the case of a person leaving raw gold for the purpose of coinage of the value of 1,000 sovereigns, he would receive only 990 in return, the ten sovereigns being retained as Mintage charges. There is no doubt that this is a very safe proceeding on the part of the Mint, but it certainly does not quite square with the "last published regula- "tions," which, as we have just seen, enact that the cost of Minting shall be three-quarter per cent. If ten pounds in a thousand be not just one per cent., we are rather at fault in our arithmetic. The Master of the Mint bears witness, however, to the fidelity with which the enactments of the order in Council, in respect to the standards of weight and fineness of the coins issued from the Sydney Mint, have been carried out. Mechanically speaking, he does not consider, however, that the coinage is so well executed as that of the British Mint. This he attributes, and no doubt justly attributes, to the fact that the coining presses of Sydney are on the *lever*, instead of the *screw* principle. Those who have had any practical acquaintanceship with the manufacture of coin, will at once admit, we should think, that the sharp blow administered by the screw press to a disc of metal, is more likely to bring out the impression from the die with the proper degree of sharpness than the gentle squeeze of a lever press.

Another advantage which the screw press possesses is, that its impact upon the metal to be converted into coin being sharp and sudden, like the blow of a hammer, it gives the piece of money a greater amount of density than it would otherwise acquire, and thus fits it better for the wear and tear of circulation. It is as well to note this in passing, because it may become a question with the colonists whether, now that their coins stand a chance of finding their way into the channels of universal circulation, it will not be desirable to endue those coins with the elements of long life.

Returning to the commercial phase of the question, we find that the witnesses examined by the committee almost all admit the inconvenience of having two gold coins, of equal fineness and weight, consequently of the same intrinsic value, and bearing the same denomination, not enjoying an equal privilege of circulation within the realm. This inconvenience is particularly experienced in the large trade carried on between Australia and our possessions of Ceylon and the Mauritius. In commerce, too, with the sister colonies named, and also with India, Manilla, Java, and other countries into which Australian gold coin largely enters, there is no doubt that the imperial sovereign is more highly valued than the sovereign at present issued from the Sydney Mint. This fact, and the complications and annoyances to which it inevitably gives rise, are considerations surely well worthy the attention of the Home Government.

In reference to this unhappy state of things, the report of the committee is singularly plain-spoken; and it almost reiterates, indeed, a remark made in the "Mechanics' Ma- "gazine" of June last on the same subject, to the effect that, "as Australia is one of the "possessions of the Crown, and the two "countries (i. e. England and Australia) "having the same currency, it may be fairly "questioned whether there ought to be any "distinction between the two coinages." The committee further assert that, by perpetuating the present arrangement, we should omit an opportunity of promoting uniformity in our gold currency, inasmuch as that arrangement invests the sovereign issued at the imperial Mint with two qualities—one being, that it must be taken by Australians as current money for all they have to sell; and the other, that until it has undergone a fresh assay, and obtained a new stamp, it is not to be available as current money in the United Kingdom.

It is for reasons such as these, and many others which we have in times past enumerated, that the Colonial Legislatures have expressed a strong desire to see the Australian sovereign relieved from the legal inferiority which now attaches to it.

The question may, as the committee suggest, be undoubtedly asked whether, if the privilege of circulation within the United Kingdom were conferred on the Sydney sovereign, Australian gold would cease to be transmitted to this country in the form of bullion, and that all the gold found in Australia would be taken to the Branch Mint of Sydney for the purpose of coinage? It may, however, be fairly assumed that the bulk of the Australian gold required in the ordinary trade with the United Kingdom would still come here in the more merchantable form of bars, as being the cheaper medium of exchange. It is not at all likely that a banker or merchant would carry gold to the Branch Mint at Sydney, and bear the expense and delay of having it made into coin at that limited establishment, the present rates of seignorage being maintained, when, on its importation to this country, the process would be more readily and cheaply effected here.

On the other hand, so long as the present restraint on the home circulation continues, the great majority of Sydney sovereigns which reach this country are forced into the melter's crucible to become again fractions of ingots, because they possess no more worth here in the form of coin than they possessed in Australia in the form of bars. The chief objections raised by the few opponents of the imperialisation of the Australian gold coinage who appeared before Alderman Salomons' committee, were "the fear of a systematic "introduction of light Australian coin into "our home circulation, and the inconvenience "likely to result from the existence of a "plurality of Mints."

The committee dispose of these puerile and theoretical exceptions in a summary but satis-

factory manner. They assert that, as to light gold being collected in Australia and sent here, the answer is obvious. Light gold in large quantities can only arise from abrasion fraudulently effected, or from fair wear and tear. The profit that might be made from such a trade must be purely visionary, for it would never pay the interest of the money necessary for carrying it on in a country where the rate of interest is so high as in Australia. It will be difficult for anyone to overturn an argument so well based as this; and we do not suppose that even Mr. Hankey will attempt the Herculean task. Supposing for a moment the possibility of Australian light gold being systematically introduced here, the loss would fall, as it now does, on the possessor of the coin. How, indeed, would it be got into circulation? Neither the Bank of England nor bankers generally would take it; nor would dealers receive it, unless in the usual way, through their scales. Looking at this notion from any rational point of view, it is, as the committee mildly say, "visionary."

There remains the other suggested contingency, a plurality of Mints. For our own parts, we can see no real objection to a plurality of Mints; and certainly at Melbourne there should be established another branch of the Royal Mint. We have three Mints in India, and we have to learn that any inconvenience has arisen from their existence. On the contrary, we think it could be easily shown that they are of inestimable good to the Indian community. Even in England, in times past, there existed a plurality of Mints.

Before the vigorous assaults of the members of the select committee, these shadowy phantoms fortunately disappeared; and, in coming to the general conclusions, which we append, the members of that committee have entitled themselves to the thanks of the British commercial public, and to the gratitude of the colonists of Australia.

It remains for the Ministry to amend the order in Council of 1854 on the bases here laid down:—"1. That gold coin be issued "from the Branch Mint at Sydney having currency in all parts of the British dominions "where gold coin minted in London is current. "2. That the coin struck at the Sydney Mint "should have, as nearly as possible, the same "alloy and the same quality of execution and "durability as that struck at the Royal Mint "in London. 3. That the coin should also "have a Mint mark sufficient to indicate, at "least to bankers and others, the Mint whence "it issued. 4. That an adequate Mint charge "or seignorage should continue to be levied, "and that the imperial Government should "stipulate for its being kept at such an "amount, as to prevent any undue inducement "to the importation into the United Kingdom "of gold in coin rather than in bars. 5. That "arrangements should be made for with"drawing from circulation, as speedily as "possible, the existing Sydney gold coinage. "6. That the charge for the Branch Mint "should be provided for by permanent appro"priation by the Legislature of New South "Wales, rather than by an annual vote."

We take the liberty of adding a 7th clause, and it is a practical one, namely, "That the "mechanical arrangements of the Sydney Mint "shall be remodelled, screw presses being "substituted for lever presses."

Mr. Blanchard Jerrold writes in the *Star*, thanking theatrical managers, manufacturers, and others, for their good offices in behalf of foreign workmen visiting the Exhibition, and stating that four banquets are being organised, to be given to foreign workmen in the Exhibition, at which British workmen are invited to be hosts.

THE CONSTITUTION OF THE ADMIRALTY.

The conduct of the Admiralty in adopting improvements does little credit to its foresight, independence, or patriotic sentiment.

It originates nothing; it contents itself with watching our allies across the Channel, moves after they have moved, but is always behind; copies their inventions, and takes no serious measures to guard against a new form of danger until it is suddenly awakened to alarm by learning from its diplomatic spies that some new class of ship, or some new armament, with augmented powers of offence and destruction, has been exclusively introduced in the naval service of our neighbours; then sudden alarm seizes the Lords Commissioners, who discover that the country is in danger, that the activity in the French dockyards portends invasion of England, and forthwith all is energy and haste in their councils. But even in these times of excitement, which are of periodical recurrence, the Admiralty makes no appeal to the immense resources and creative power of our private yards without the sanction of the Controller of the Navy, who governs the maritime destiny of the nation. The Lords are dependent on this powerful but inefficient official. The trammels of routine cannot be shaken off. "Perish the colonies, rather than abandon a "principle!" cried the enthusiastic republican; "Perish the nation, rather than cast off the "tutelage of the Controller!" is the undying sentiment of my Lords. The extent to which this sentiment is acted upon would be ludicrous if it were not so fatal to the best interests of the country. Under the tall portico in Whitehall, red tapeism is predominant. Does a question arise which in any way relates to construction, straight it is referred to the Controller, who refers the matter to his subordinates, for he will not venture to form an opinion of his own, and their fiat is reported to the Board, and determines the final decision. Then it comes to pass that they who know the ways of the Admiralty, and have the *entrée* to the official presence, attain their object; but the uninitiated, to whom the avenues to that distinction are tabooed, have not a chance of success for the most legitimate and advantageous proposals. The report goes forth that these proposals are not beneficial to the service, or that they offer difficulties of execution, and forthwith a stereotyped letter is addressed to the applicants, informing them "that their "Lordships are not prepared to adopt the pro"position." This euphemism of cold refusal is sometimes varied with "at *present*," leading the deluded individual to the fallacious hope that his proposal is not finally rejected, and he lingers at the Admiralty threshold in all the misery of hope deferred. A gallant Captain, it has been lately stated, danced attendance on the arbiters of naval construction seven years, and when at last, in his despair, he wrote to the *Times*, and appealed to the House of Commons, he was upbraided as an ingrate, who listened to the counsels of injudicious friends, and affectionately told to rely upon the Admiralty.

It was the Secretary who gave this kind advice. But let us see how he acquired his post: was it by relying on the Admiralty? If we remember rightly, it was by a totally opposite course that he succeeded in grasping the emoluments of office, which offered great attractions to his mind. By diligent research, and the help of a friend who was not *green* in the arcana of naval construction, he produced an analysis of Admiralty accounts so profound that it was incomprehensible; but this constituted its chief merit, and he proved—at least, he said he proved — that there was a deficiency of three millions in the Controller's accounts. The sensation created by this bold assertion at the time is not forgotten. It answered its purpose. The self-constituted auditor of the Controller's accounts obtained the appointment he coveted. Why should he not? Had he not exposed a great delinquency, and deserved his reward? But what followed? No sooner was the new Secretary in office, than it oozed out that there was some oversight in his calculations: he had to retract his charges, and admit he had discovered a mare's nest. Would it not be thought that on this exposure of ignorance, or something worse, this pretender would be ousted from office? But no such thing; he was appointed by his colleagues as a congenial spirit, and quite lately the Premier told the House of Commons he congratulated himself on having so useful and clever a secretary.

If we attempt to analyse the constitution of the Admiralty, we find it composed of a singular triumvirate, namely, the Lords, the Secretary, and the Controller, whose powers and attributes are so strangely blended and so oddly dependent on, or independent of, each other, that the public has not the most remote conception, and it would puzzle themselves to define, where the jurisdiction of each begins and ends. Are they coeval and coexistent, and do they possess a joint and common power, a veritable "*tria juncta in uno*," or does each exercise a separate action, for which he is responsible? These are some of the mysteries we have referred to.

Dismissing metaphor, we opine that in this anomalous composition is to be traced the notorious inefficiency of our naval administration. For executive incapacity it is not to be equalled by any department of the most despotic and corrupt Government, and there will be no improvement until the Admiralty is reorganised. Our ancestors were sensible of the defective character of the institution, and, as a corrective, conceived the idea of a Lord High Admiral; but the appointment of this exalted officer, which was the embodiment of an occasional Minister of Marine with dictatorial powers, was made only in cases of emergency. The existence of such power vested in the Crown proves a wholesome mistrust of the ordinary administration of the navy. Aristocratic jealousy is, no doubt, the reason why the office has fallen into desuetude, and we cannot say we are in favour of a kind of ministerial appointment which depends upon the "*bon plaisir*" of the sovereign. At the same time, we see in the existence of this right the germ of a better order of things than "Lords Commissioners," and, without intending any discourtesy to my Lords, we shall rejoice when their office is abolished, and a responsible Naval Minister appointed in their place. The noblemen and gentlemen who rejoice in the title of "my Lords" are all honourable men, and no doubt patriotic, but it requires little wisdom to understand that a power so divided, so irresponsible, and so servilely dependent on its own executive department must be, as it is, feeble, vacillating, and effete.

Only fancy a commander-in-chief being under the orders of his own commissariat; but that is precisely the position of the Lords in respect of the Controller. No doubt all the officials of the Admiralty intend to do their duty, but irresponsibility begets indifference and represses talent. Each hopes to escape censure for any mishap by referring everything to some one else; and, under such

enervating influences, each thinks more of the honours or the emoluments of office than the performance of a public duty.

Under this strange constitution, the Controller, although nominally under the order of the Board, holds the sovereign power, because, in a manner, he guides if he does not hold the conscience of the Lords, who are so conscious of this fact, and feel themselves so helpless without his guidance, that it would be a bold Lord who, on a question of construction, should travel out of the tradition of routine.

The Secretary of the Admiralty—it is hardly possible to define his position. In the House of Commons he is almost a Minister, and takes a tone and attitude which lead foreigners to regard him as the "Minister of Marine." Many Englishmen, we are persuaded, ascribe to him the same high attribute, and the puissant Lords, his masters, are often glad to shelter themselves under his wing. To give a familiar idea of the composition of this department, no comparison is more to the purpose than the management of a joint-stock company. The Lords are the Board of Directors; the Secretary is the clever official with the same title who leads the Board, and the Controller is the shrewd manager who conducts the works, who has a good understanding with Mr. Secretary, and, by making himself agreeable to the chairman, usually manages everything and everybody. But this is not the organisation for a great public department of a great nation, and we hope soon to see the day when it is superseded by a Navy Minister, with power and responsibility duly combined.

An event of importance to the country, which has occurred within a few days, is a proof of the lamentable maladministration under the present system. Shortly after the trial of the Minotaur target at Shoeburyness, the failure of which was fully reported in our columns, the Admiralty, convinced by the result that the mode of armour-plating adopted for the frigates of that class was less effective than that of the Warrior, determined to make some change, so as to insure more efficient protection to those vessels. The constructive talent of the Controller, who was the designer of the plan which broke down at the trial, was again called into requisition, and, under his orders, two plans of modification were devised. These were submitted to the contractors for the Minotaur vessels, who were requested to send in estimates of the expense which the change would entail. Contractors never fail to profit by alterations in a specification, and it turned out that one of the contractors demanded for those proposed some 6,000*l*. or 8,000*l*. in addition to the contract price. The Admiralty, dissatisfied at this demand, declined further negotiation with the firm in question, and ordered the frigate to be completed, according to the original design, with the armour-plating *unaltered*.

Here we have a sad picture. First, a system of armour-plating, rashly adopted *without previous trial*, is ordered for three large frigates. Then, admonished by the defects of the Warrior system, which also had been adopted without previous trial, the Admiralty bethink themselves of experimenting on a Minotaur target, when, to their dismay, they discover that with plates $5\frac{1}{2}$ inches in thickness, when those of the Warrior are only $4\frac{1}{2}$ inches, the supposed improved plan is worse than its predecessor. Forthwith two new plans are contrived, and these, again, with no guarantee for their efficacy but the opinion of the Controller, who was twice wrong before, are proposed for adoption *without trial!* One is amazed and bewildered at such inconsistency. But the climax is to come. Because the Controller and the contractor cannot agree about price, the avowedly bad system—proved to be bad by actual trial—is to be carried into effect, and a magnificent frigate, superior to the Warrior in dimensions, armament, and power, is to be left to the chances of defeat and destruction in the first battle with a hostile ship more efficiently armour-plated than herself.

We cannot repress our indignation at this act, and we trust, if there be yet time before the close of the session, a question will be put to the first Lord of the Admiralty, so that the precise truth of this astounding dereliction of duty may be known. A decision thus come to with unpardonable levity and haste, whereby a splendid war ship, which will cost nearly half a million, and the honour and security of the nation are jeopardised, is an act which certainly would justify the impeachment of the ministers who should deliberately sanction it. We pause till next week for an explanation, and we shall rejoice if it can be shown we are mistaken.

CAPTAIN GRANT AND THE WAR DEPARTMENT.

CAPTAIN GRANT and his dealings with the War Department will one day form a most interesting portion of the biography (should it ever be written) of those inventors who have made proposals to the Government Departments, and been more or less engaged in carrying their plans into execution. With a persistency of purpose which does much credit to General Lindsay, he has succeeded, first, in obtaining copies of all the correspondence that has taken place this year between the Under-Secretary of War and Captain Grant, respecting his claims for the services he has rendered in improving the system of cooking in the army; secondly, of all official reports that have been received at the War Office upon the system of cookery established by Captain Grant at the various camps, and upon his ambulatory cooking apparatus; thirdly, in getting what we may call a practical majority in the House of Commons in favour of Captain Grant being remunerated for his trouble; and lastly, in obtaining the consent of Sir G. C. Lewis to the appointment of a committee of enquiry into Captain Grant's claims. Thus the battle has been fairly fought and won; for, although committees of enquiry are not infallible, yet there is no reason to doubt that some justice will be done upon the termination of the committee's labours. No man should be subjected to the necessity of making such innumerable applications as has been requisite in Captain Grant's case, not only before obtaining substantial reward, but even before obtaining permission to place the facts before an impartial tribunal. We have no desire to offer any opinion upon the exact amount fairly due to the Captain for the time and trouble he has taken to improve the cooking for the army, although to determine this there is abundant matter now before the public, but we are desirous of pointing out the very important fact, that Captain Grant's claims cannot equitably be made to depend upon the question of his arrangement of cooking apparatus being the best or most economical now known or in use.

It must be recollected that it is now upwards of *seven years* since Captain Grant first drew attention to the imperfections of the ordinary arrangements in use for cooking soldiers' food, whether in barracks, or on march, or in camp. Some six years since we fully examined his plans in use at Woolwich, and, although we believed at that time that the whole of the arrangements were not so perfect as they would ultimately be made, no one could possibly doubt that an immense step had been taken towards a permanent improvement in cooking for the army. In the ordinary kitchen we visited at Woolwich, ranges of seven coppers were heated by seven distinct fires, which, of course, had to be separately lighted and attended to, there being no arrangement whatever for baking any part of the food. Nothing could possibly be more primitive than the whole system adopted, not even excepting the cooking arrangements of a party of common gipsies. An immense quantity of fuel was necessarily wasted, owing to the multitude of fire grates, and, as we have stated, no baking could be done at all. We believe a few soldiers, in turns, had permission to take their dinners to a baker's oven; but from the great distance the food had to be brought, as well as the expense of getting it baked, few availed themselves of the privilege, the result being that the men lived wholly upon boiled food, or nearly so.

In Captain Grant's arrangement, *one fire* did the whole work, boiling as many kettles, and at the last heating an oven, in which any fair proportion of the men's rations could be well and easily baked. The utility of fitting up this improved apparatus was, however, by no means confined to the actual economy and convenience then experienced by its use. It showed the miserable system upon which the soldiers were before compelled to cook their food, and naturally *set people thinking* as to what could be further done. In a word, Captain Grant, against much opposition and discouragement, *originated the movement* for improving army cooking; and if all the barrack authorities put together were now to give evidence that subsequent plans of cooking were preferable to Captain Grant's, this could not alter his claim to compensation, inasmuch as at the time he introduced his system, however imperfect in some of its details it might have been, it cannot be denied that it was very greatly superior to other methods, or rather to the only method then in use. We must recollect, however, that no such general condemnation of Captain Grant's plans has at any time been made. Indeed, we find, throughout the reports and correspondence on this subject, many very weighty reasons for preferring his apparatus to that used by others. By one report, dated February 1857, we find, from careful experiments in cooking for 424 men, the cost of cooking with Captain Grant's kitchen was 2*s*. $6\frac{3}{4}$*d*., whereas that of cooking in kitchens of the barrack pattern was 3*s*. $3\frac{3}{4}$*d*., and that of the gas kitchen 5*s*. 10*d*. Moreover, that the men much preferred the meat baked in the first apparatus referred to.

Captain Grant's claims must be judged by a comparison of his apparatus (perhaps in its most *improved* form, inasmuch as the War Department have so long resisted those claims) with that in use at the time he introduced his apparatus into the service. It has, doubtless, been an easy matter for others to take up the subject since Captain Grant first applied himself to it, and, having before them the numerous experiments he has made, to devise methods of arranging plans which may have some advantages. We by no means say this has been done — there is no proof of it having been done; but if it has, or should it hereafter be accomplished, it will be mainly due to Captain Grant's exertions. To him, then, let recompense be first made.

MANUFACTURE OF DAMASCUS SWORDS.

IN olden times the city of Damascus, in Syria, was renowned for its cutlery, and particularly for the manufacture of sword blades. The fame of these swords extended throughout Asia and most of Europe. They were so elastic that they could be bent like hoops without breaking, while at the same time their cutting edge was as keen as that of a razor. Damascus blades possess a wavy surface of regular bright and dark lines, and the mode of manufacturing them was kept a profound secret by the armourers of that city. Rees, in his Cyclopædia, states that they were made of a peculiar kind of steel, and it was the character of the metal, not the mode of making them, which gave them such superiority. The same idea is conveyed in the interesting article on the subject in the "New American Cyclopædia." From information which we have received on the subject—and which we shall hereafter cite—such statements do not appear to be reliable. Rees says of Damascus swords:—"About the beginning of the fourteenth century, Timeur Leng, on his conquest of Syria, conveyed all the celebrated manufacturers of steel from Damascus to Persia. Since that period its works in steel are little memorable. They were formerly of the highest reputation in Europe and the East. The famous sabres appear to have been constructed by a method, now lost, of alternate layers, about two or three times thick, of iron and steel. They never broke, though bent in the most violent manner, and they retained the utmost power of edge, so that common iron, and even steel, would divide under their force."

The method of manufacturing Damascus blades was undoubtedly lost for centuries, but the "New American Cyclopædia" states that the Russian General, Anossoff, rediscovered the process of producing Damascus steel, by smelting 11 lbs. of charcoal iron in a crucible with $\frac{1}{12}$th of graphite, $\frac{1}{32}$nd part of iron scales, and about $\frac{1}{24}$th of a fusible flux such as dolomite. These substances are submitted to intense heat, in a blast furnace, for about five hours, when the scoria is scummed off, and the molten ingot of steel thus formed is drawn under the hammer, and submitted to several heatings and hammerings. Of steel thus made, it is asserted that General Anossoff made several blades like those of Damascus, having the same dark and light wavy lines, which were produced after the blade was formed by pouring dilute sulphuric acid over it. General Anossoff died in 1851, and it is stated that his successors have not been able to produce such like swords. We do not wonder at this, for assuredly swords of the Damascus appearance, with wavy lines, cannot be made from bars of pure steel. The waving lines on such swords nearly resemble the minute and graceful shadings of the fine watered silk of which ladies' dresses are made, and they are due to the method of fabricating the blade, and also to the combined metals of which it is composed. Blades resembling the old Damascus cimeters are not uncommon in this city, and they equal them in temper and elasticity. We are indebted to Mr. Herman Vasseur, No. 9 Maiden Lane, in this city, sword mounter and scabbard manufacturer, for a description of these blades. They are made at Solingen, in Germany, the only establishment of the kind in the world. A faggot is first formed of alternate fine bars, or wires, of iron and steel. Such a faggot is then drawn out, doubled and twisted several times, and formed into a ribbon. Two of such forged ribbons of iron and steel are then welded together, enclosing a thin blade between them of the best cutting English steel, and thus a Solingen Damascus blade is formed. The interior thin blade of English steel gives the sword a desirable and perfect cutting edge, and the combined twisted iron and steel outside layers impart to it peculiar toughness as well as the beautiful wavy surface for which it is also much prized. When ground and polished, no wavy lines are recognised, but by dipping the blade for a short period into dilute sulphuric acid, a portion of the iron on the surface is dissolved, while the carbon of the fine steel bars is unaffected, and appears in dark wavy lines contradistinguished from the white wavy surfaces of the iron bars. These blades are imported plain, and mounted in this city. Mr. Vasseur has lately mounted some of them in a splendid manner, to order, as presentation swords for several officers of our army and navy. The scabbards are made wholly of silver, and highly ornamented, while the hilts are tastefully mounted, with appropriate designs, partly cast and partly engraved. A silver scabbard is made by hammering rolled plate silver upon an iron mandrel of the proper form, and thus the plain sheath is produced. The ornaments, consisting of neat designs in silver, are cast from patterns, then trimmed and soldered to the sheath. A considerable portion of these silver scabbards are also gilt. They are certainly splendid specimens of sword mounting.

The inlaying of iron and steel with gold and silver is called Damaskeening, because this art was carried on upon a great scale when Damascus was the armoury of Syria. It is executed by cutting burr grooves with a cold chisel, in the steel before it is hardened, and then hammering gold or silver wire in these grooves. This art is of great antiquity. We have read and heard it frequently stated that the superiority of Damascus swords was due to the mode of tempering them. This consisted in heating the hardened blade to a blue colour, and handing it to a rider sitting on horseback, who instantly started off at a gallop, waving the blade against the cold north wind, which was required to be blowing at the time, or the operation could not be performed. We put no credence in such stories, because it is scarcely possible to temper a piece of very thin steel by waving it in the atmosphere, at a high velocity, during the coldest days in winter. The beauty and superiority of the Solingen blades must be credited chiefly to the skill of the artisans who fabricate them.—*Scientific American.*

THE INTERNATIONAL EXHIBITION.

CLASS I.

(Concluded from page 53.)

THERE are some beautiful and interesting objects in Class I. of Norway, especially the native and other silver ores from Kongsberg. Aall and Sons exhibit magnetic iron ores and products obtained therefrom at the works at Næs, near Arendal. Among these are specimens of pig-iron, bar-iron, and steel, which, doubtless, are of good quality.

Belgium displays an extensive and well-arranged series of her mineral products; and among them are very numerous and characteristic specimens of brown hæmatites, and these, if we mistake not, are the chief source of her iron. It would appear from the labels attached to these specimens, that the ore contains on an average about 34 per cent. of iron. The Belgian coalfield, like that of Northumberland, is deficient in workable measures of clay iron ore. There are some fine specimens of a somewhat peculiar variety of red hæmatite, which is stated to occur at or below the base of the carboniferous limestone at Vezin, near Liége, No. 28. Ore extremely similar to this in all respects has recently been discovered in South Wales, in a similar geological position. We regret that we cannot congratulate Belgium on the position which she occupies in the Exhibition with regard to her iron industry as illustrated in Class I.

France has interesting objects in Class I., which we shall notice hereafter, but there is little to indicate her possession of extensive iron-making resources. Brown hæmatite occurs extensively in the oolite of France, and is the chief ore smelted. Beautiful brown hæmatite and some spathose ore are found in the Pyrenees, and have furnished supplies during several centuries to the Catalan forges of that district. We consider that the iron manufacture of France is very imperfectly represented at the Exhibition, many of the great works not having contributed a specimen. We are at a loss to divine the reason of this, unless the ironmasters across the Channel feared competition with the world, or, under the protection of existing tariffs, felt no stimulus to exertion.

Spain is wretchedly represented in Class I., and this is greatly to be regretted, as it is well known that she possesses great mineral wealth, which, of late years, has been rapidly developed. It is obvious that the persons intrusted with the arrangement of this class knew absolutely nothing about their business; and we have been informed that the jurors have made several ineffectual attempts to extract information from them. Their courtesy was all that could be desired, though their ignorance was profound. One reason which they assigned for the poverty of the collection was, that they were not allowed to accumulate too many heavy articles on the gallery where it is placed; whereupon a French *savant*, who happened to be present, exclaimed with characteristic *naïveté*, "Mais pourquoi avez-vous mis vos étoffes en bas et vos pierres en haut?" Another and much better reason is, that more than 100 cases of minerals are lying in the docks for want of sufficient space in the Exhibition. This is to be deplored, as there can be little doubt that both Spain and Great Britain would be mutually benefited by a display of their contents. Is it yet too late? We have heard it stated that the gentleman charged with the direction of this class is a Colonel of Artillery, and related to His Excellency the Spanish Ambassador; in which case all that can be said is that the mineral kingdom of Spain has a far less efficient representative at the International Exhibition than the political kingdom at the Court of St. James.

Portugal makes a respectable appearance in Class I., but there is really nothing relating to iron. It is presided over by a well-informed Portuguese mining engineer, M. Cabral, who is anxious to do his best to develop the mineral resources of his country. A useful catalogue in French of the specimens exhibited in this class has been published.

The kingdom of Italy has acquitted herself with much credit in Class I. The collection is extensive, and in many respects highly interesting, especially in reference to ores of copper and lead. It contains beautiful and characteristic examples of specular ore from Tuscany, of brown ore and spathose carbonate from various districts. The vicinity of Bergamo is classic ground in the history of iron-smelting. There is an excellent descriptive catalogue of this class in Italian.

Canada is most worthily represented in Class I., thanks to the director of the Canadian Geological Survey, Sir William Logan. Justice compels us to deviate from the course which we have hitherto pursued, and bestow more than a passing notice on this indefatigable geologist. Unaided, he commenced, in 1831, a geological survey of part of the great South Welsh coalfield extending from Cwm Avon to Carmarthen Bay, and completed it in seven years, at no small pecuniary sacrifice. Such was the estimate of the accuracy and value of this survey by the late director of the Geological Survey of Great Britain, Sir Henry De La Beche, that, with Sir William's consent, it was adopted as part of the national work. In 1842 Sir William went to Canada, where he has ever since resided, devoting his life, with a singleness and earnestness of purpose truly remarkable, to the exploration of the structure and the mineral resources of that vast territory. Not having the advantage of an accurate map of the country, such as has been supplied to our home geologists by the Ordnance Survey, he has been obliged to make a topographical survey *pari passu* with a geological one. Few persons can imagine the arduous nature of this work. Our indomitable geologist is often compelled to penetrate the trackless primeval forest, to force his way across the tangled cedar swamp, and brave the dangers of Canadian Rapids in a frail canoe; and to these difficulties we may add that his path is disputed at every step by the most relentless and invincible foes with which man in these regions has to contend—countless hosts of mosquitoes and black flies. Very different is the comparatively light and gentlemanlike occupation of our home geologists, who have no such hardships to encounter, and, after the pleasant ramble of the day, never fail to enjoy the luxury of an English cottage. Sir William Logan has neither sought wealth nor

honours, but has quietly and modestly pursued the one great object of his life with a devotion as rare as it is praiseworthy. Let it not be supposed that this eulogium is prompted by any feeling of personal regard: it is a just tribute, and no more, to a man who has striven, during many years, to develop the vast mineral resources of Canada, not with a view to his own advantage, but from pure love of his work. We are glad to know that the Canadian Government fully appreciate the value of the labours of this self-denying and faithful public servant. The Canadian territory comprises about 300,000 square miles, and about 100,000 have already been surveyed by Sir William and his small staff of assistants.

Enormous deposits of magnetic iron ore—which, when pure, is the richest of all the ores of iron—have been discovered by Sir William Logan in the Laurentian rocks, which present no traces of organic remains, and are the oldest sedimentary series in the world. The ore occurs interstratified with the rocks containing it. The accumulation of this ore in some localities is so great as to appear incredible. Thus, one bed is not less than 500 feet thick! On the Rideau Canal there is another bed 200 feet thick, which is now worked at Newborough, and from which the ore is conveyed to Kingston on Lake Ontario. From this place it is put on board vessels at a cost of \$2¼ per ton and taken to Cleveland, on Lake Erie, Ohio, whence it is sent to Pittsburgh, Pennsylvania, to be smelted. The best quality of ore is met with in a bed 25 feet thick in the township of Madoc. Fine samples of all these ores are exhibited. Canada also possesses extensive tracts of bog-iron ore on the north side of the St. Lawrence, and this is the only ore which is at present smelted in the country, charcoal being the fuel. The smelting is conducted at the Radnor Works, which include a forge for the manufacture of iron. At these works a large number of railway wheels are made of cast-iron derived exclusively from bog-iron ore. Cast-iron from ordinary bog-iron ore is about the last kind of metal many founders would dream of employing for such a purpose; and yet in the Canadian department of Class I. is exhibited a pair of railway wheels which have travelled, without showing much evidence of wear, not less than 150,000 miles, or about six times round the earth. And it should be remembered that in Canada there are great alternations of temperature, the heat of summer being intense, and the cold of winter extremely bitter. These bog ores must be exceptionally free from phosphoric acid; for otherwise they would yield a tender, and not a strong iron like that of which the wheels above-mentioned are stated to consist. Massive and characteristic specimens of magnetic ores are exhibited, as well as fine specimens of bog-iron ore and red hæmatite. Large lumps of red ore from the Silurian rocks are also shown, but they are of inferior value from containing a large amount of earthy matter, and frequently less than 50 per cent. of metallic iron. There is a descriptive catalogue, by Sir W. Logan, of the economic minerals in the Canadian department, which is replete with valuable information, scientific as well as commercial, and we can recommend it with confidence to all who are interested in the subject.

Nova Scotia makes a good display of her mineral products, and among these are large lumps of brown hæmatite and specular iron ore, which supply the furnaces of the Acadian Ironworks. Pig and bar iron from these works are also exhibited. In the useful descriptive catalogue of the articles sent by this province it is stated that 1,200 tons of iron are annually made, of the value of 16*l*. per ton. The present Acadian Company, we have reason to know, differs much in proprietary and management from the old company of the same name, which a few years ago, it may be remembered, somewhat ostentatiously obtruded its iron upon the British public as of surpassing excellence. When complaints were heard of the bad quality of our cast-iron ordnance during the Crimean war, it was loudly proclaimed that Acadian iron was the thing wanted to insure perfection in future, and considerable quantities of it were supplied to the Arsenal at Woolwich. Some of it was found to be good, and some wretchedly bad, as anyone may learn by consulting the valuable blue-book on "Cast Iron Experiments" published in 1858. In four out of eight analyses of Acadian pig-iron given by Mr. Abel, chemist at the Arsenal, in this Blue-book, the phosphorus ranges from 1·3 to 2·1 per cent., and in one sample of grey pig the silicon amounted to 4·23 per cent. We trust the present company may not unjustly suffer from the mistakes of their predecessors; but the old proverb, "Give a dog a bad name," &c., may apply to an iron company as well as our domestic friend. It is declared that some bad varieties of ore formerly used have been discarded, and of these specimens were pointed out to us in the Nova Scotia department with no small degree of contempt. Why, then, were they exhibited?

The Australian department is specially distinguished for its magnificent copper ores, to which we shall revert on a future occasion; and we noticed a large and fine specimen of spathose carbonate of iron. This may possibly indicate the existence of deposits of ore which may hereafter prove more valuable than stores of gold. But we are reminded of the gilded pyramid facing the entrance at the eastern dome. We are informed that this is an exact measure of the bulk of all the gold hitherto extracted in the colony; but we confess that it fails to impress us with the idea of magnitude, and though the conception is ingenious, its realization in the form of a pyramid is a failure. This object is, we presume, called a trophy, and the following well-known lines might with propriety be inscribed upon it, with a view to the edification of all, including even Her Majesty's Royal Commissioners:—

> "Gold! gold! gold! gold!
> Bright and yellow, hard and cold,
> Molten, graven, hammer'd, and roll'd;
> Heavy to get, and light to hold."

There is an interesting series illustrative of Class I. in the Indian Department. Iron ores, chiefly earthy-brown hæmatite and magnetic iron-sand, occur abundantly in several parts of India, and have been smelted, from time immemorial, by the natives, in small furnaces. The East Indian Iron Company, No. 3, sends an instructive collection of iron ores and the various products which they yield. There are several blast furnaces in India on the European model, using charcoal as fuel. An excellent series of the various kinds of iron-sand smelted by the natives will be found under No. 10. It is a remarkable fact that in one locality in the Nerbudda Valley, good bar-iron, but only in small pieces, can be made and sold by the native smelters under 5*l*. per ton. But the selling price of native iron in most parts of India is generally about double this sum. In the native process the iron is obtained direct from the ore in the malleable state, and pig-iron is not formed. All iron was formerly produced by this direct method; and to this day it is still practised in the Pyrenees, Finland, and some of the northern parts of the United States.

In the official catalogue only three numbers appear in Class I., and occur in the department of the United States. There is a good series of American minerals, including specimens of Lake Superior copper. Fine spiegeleisen from New Jersey Franklinite, a zinciferous ore of iron, is exhibited. The ironmaking resources of the United States are very great, and, it is scarcely necessary to observe, are not represented in the present Exhibition.

There is scarcely a department in the Exhibition in which some iron ore may not be found; but we believe that we have called attention to all the iron ores which seem to be practically valuable. We shall next proceed to a connected review of all the objects in the Exhibition specially illustrative of the metallurgy of iron. — *Times*.

In the last three years 590 proposals and plans for the purposes of shot-proof ships have been sent in to the Admiralty. They were all referred to the Controller of the Navy and the assistant officers of his department, and only 105 of them reached the further stage of being submitted to a committee or referee; 37 are still under consideration.

ON STEAM-BOILER EXPLOSIONS.

The following is an abstract of the paper read before the members of the Institute of Mining Engineers by Mr. Stephen S. Crone, M.E., of the Killingworth and Seaton Burn Collieries, "On Steam-Boiler Explosions:"

The serious and disastrous consequences usually resulting from steam-boiler explosions were of such an important nature as to require the closest investigation, as under the most favourable circumstances they are generally surrounded with difficulties, and attended with results which, in the present state of our knowledge of the subject, it seemed difficult to account for in a clear, practical, and satisfactory manner. Mr. Crone proposed giving a minute descriptive account of the accident, as a record of facts, to aid those interested in the investigation of these, to say the least, mysterious occurrences, which ever ought to be carefully enquired into, and their attendant consequences, to endeavour, as far as possible, to arrive at the true source of the accident.

The boiler which exploded (No. 4, at Seaton Burn,) was 32 ft. long, 6 ft. 8 in. diameter, working at a pressure of 35 lbs. to the square inch, being one of six large cylindrical boilers, varying from 32 to 35 ft. long, coupled together with 8-in. steam pipes. There were two ranges of feed-pipes, two safety-valves, two floats, one of which was an alarm whistle float. The boiler mountings were constantly examined, and kept in proper working order—everything calculated to guard against accident. The boilers were also attended to by steady, experienced men; but, from some unexplained cause, the plates of the boilers would seem to have been over-heated, and the explosion followed, with a fearful amount of violence—the boiler mounting about 120 ft. straight up into the air, and dividing into three portions, the main portion falling 97 yards to the east, a huge sheet, rent and ruptured in the most extraordinary manner, the fire end being reversed from its original position, evidencing an extra amount of force at that end, as the boiler must have turned round in its flight after leaving the boiler-seat. The second portion went more northward; and the third, a part of the fire end, went in an opposite direction to a distance of 76 yards, giving strong indications of having been ruptured with great violence. Sketches of these portions were laid before the Institute. The boiler-seats were shattered, blown down to the foundation, and as completely destroyed as if a mine of gunpowder had been sprung beneath them, and the boilers thrown about in various directions, the outside one turned bottom upwards. The boiler had only been at work one day before it exploded, after having a thorough examination, repair, and cleaning. The safety-valves, and other boiler mountings, had been stripped, cleaned, oiled, and everything done to make them efficient. The boiler was quite tight, and no leakage visible.

It was doubtful, from some unexplained cause, that the boiler had been deficient of water. The consequences might be something like the following:—The firing going on as usual, the upper portion of the boiler would become over-heated, especially from the edge of the water to the top of the flue; the tenacity of the plates would be weakened as their temperature increased above 550°, and the liability to rupture greatly augmented by the unequal straining of the iron consequent upon the temperature of one portion of the boiler being so different and variable from other portions; the steam and water would become surcharged with heat to a considerable degree above that indicated by the pressure of the steam—thus storing up power, whilst the plates were decreasing in strength, until some disturbing influence suddenly reduced the pressure of the steam from the surface of the highly-heated water, which may arise from the sudden opening of a safety-valve, or exhaustion caused by the opening of the steam stop-valve; by standing or starting the engine, or in cases similar to this, where a number of boilers are connected, such, perhaps, not supplying a uniform quantity of steam; by a sudden draught of steam to the engines working; or, finally, by the gradually weakening

plates of the boiler at last giving way, and splitting open at a weak joint.

Upon examination after the explosion, no part of the plates measured less than $\frac{3}{8}$ in. thick, but from the exposure of the rivets and fractured seams it was evident the boiler had been originally of defective construction. The rivet holes were not opposite each other, and had been picked or cut out into an oval form, and forcibly drawn together by means of drifts or pins, to get the rivets entered and driven up, irrespective of their being at right angles to the direct strain upon the joints. The immoderate use of drifts or pins, as well as excessive caulking, was a clumsy, injurious remedy to defective workmanship in the construction of boilers, and could not be too much censured. The forcible unequal strain and compression by those applications, as having all the effect of a wedge driven in, must cause lasting injury and constitutional weakness; the plates being injured near the edge, where they are least capable of resistance, and most likely to give way, and where, perhaps, they may be laminated and faulty by being pared or slabbed too near the edge. The effect of this is often seen by the plate cracking from the rivet holes, and fractures proceeding along the line of rivets for considerable distances, thus greatly augmenting the danger of accidents to boilers. This objectionable method had, no doubt, injured the plate, resulting in a point of very questionable strength.

Referring to the interesting experiments which have been tried as to the effect produced on water thrown upon red-hot plates taking the spheroidal form, the temperature of maximum vaporisation for iron has been variously stated from 300° to 350°, and the temperature for perfect repulsion of drops of water about 400°, at which temperature the water does not wet the metal under atmospheric pressure, but assumes the spheroidal form, or small spheres, enveloped in a thin coating of steam, having the power of reflecting the heat, and preventing immediate contact with the iron; the water in this form rolling about, with its elastic coating, evaporating very slowly, and not flashing into highly elastic steam, as might be assumed would be the case. But it must be remembered these experiments have generally been tried under simple atmospheric pressure. It is most remarkable these spheroids never reach a temperature of more than 205°. I think it may be doubtful whether inside a steam-boiler, heated to redness, this effect would be produced upon any large body of water at a high degree of temperature, and under the pressure of several atmospheres, as it may be assumed the pressure of the steam in the boiler would overcome the reflecting power of the spheroid when near the plates against which it might be dashed, and thus cause the sudden production of a large quantity of steam upon any disturbing influence putting the steam in motion, such as the opening of valves, &c., or even sharp heavy firing, causing the water to rise to a higher level than at the time the plates were heated. Whether this is the case with red-hot plates or not, it is certain that plates at a lower temperature, about 300°, which gradation must, of course, exist before the plates are red hot, are capable of producing steam in a most rapid manner, upon water being brought in contact with them, and thus cause the most serious consequences.

The result of boiler explosions generally indicated the exertion of such force and violence as to have encouraged the supposition that they must have been caused by some more explosive agent than steam, which, in ordinary everyday work, we hold so completely under control. Electricity and hydrogen gas have generally been selected as the forces most likely to produce such destructive effects, but how either the one or the other is generated we are left entirely to imagine.

A curious and uncommon circumstance had occurred at Seaton Burn about fifteen years ago. A boiler had been boiled dry through the failing of the feed: the engine, running all the time, exhausted the steam, until the supply failed, when it stopped, and could not be moved. The fire was withdrawn, and the boiler allowed to cool down. When a sludge-hole close at the bottom was taken off the following morning, and a lighted lamp held at the hole, a long flash of flame issued out four times, gradually retreating into the boiler, where it was soon consumed. No doubt a portion of the water had been decomposed, the hydrogen liberated, and the oxygen fixed with the iron; the former would get largely mixed with atmospheric air through the rivet holes and vents, which were loose and burnt, thus forming a weak explosive compound, which fired when it came in contact with the flame of the lamp. This boiler was quite new; had it been an old or weak one it might have given way and exploded.

Mr. Crone then explained the boiler fittings now in use at Seaton Burn Colliery. A blow-off pipe was particularly described. A pipe about 2 inches diameter was placed at the top of the boiler in a diagonal direction, within the boiler, to a point 1 foot beyond the end of the fire-bars. A small round hole was bored in the pipe, a little above the lowest working line of the water in the boiler. The pipe outside the boiler was bent down into the fire-hole, in which was placed a cock, easily accessible to the fireman: this cock required to be turned frequently, at short intervals, say, every half hour: when turned, the water and mud were blown out from the bottom, and the steam pressing the water towards the small hole at the top, made a whirlpool, which drew the skum from the boiler, and blew it out above. Should the water be below the hole at top, of course, nothing but steam issues, thus indicating unmistakeably that the water is low, and becomes a good check upon the floats. This was called a blow-off, skimming, and gauging pipe, and is a remarkably useful and inexpensive application. One party who had used it was compelled, previous to placing the pipe upon his boiler, to clean it out every month, when about an inch of mud was always taken out: after using the blow-off pipe the boiler was opened out, and found quite clean. It has gone for eight months, and is still clean when opened out.

It was reasonable to anticipate that boiler explosions might, at least, be reduced in number, by the boilers being well constructed, and of good materials; the working steam pressure regulated to suit the nature and character of the boiler, and reduced as it may get deteriorated by age and wear; boilers carefully used, cleaned, and examined throughout by careful, competent workmen, every time they are opened; the mountings of such a form as effectually to perform what they are destined to do, and examined at short periods—every hour or less; the feed-water regulated by careful and trustworthy men; safety-valves closely examined, and firing regulated to requirements of engines. These arrangements, carefully attended to, may at least insure comparative safety.

THE HOUSE OF COMMONS AND THE ARMSTRONG GUN.

On Monday last the attention of the House of Commons was called to the condition of the country in its relation to the Armstrong gun.

Lord H. LENNOX said, the item he particularly wished to refer to was that for Armstrong guns, which was included in Vote 13 for land and sea services. It would be in the recollection of the House that on Friday last his hon. friend the member for Liskeard (Mr. B. Osborne) asked whether it was true that the second large Armstrong gun had been loaded with 10 lb. plus powder, and that it burst on being fired, and had been rendered unserviceable. He added that, if that were the case, he thought a committee of scientific men should be appointed to test the principle on which the gun was made. The Secretary of State for War replied that it was perfectly true the gun had burst and was unserviceable, but declined to grant any further enquiry. Since that time circumstances had come to his knowledge which justified him (Lord H. Lennox) in bringing the matter again before the House, and asking the Government for information. The House was probably aware that the French had an admirable system of testing their artillery, and that they not only ascertained the gun's power of resistance from within, but its external power of resistance—that they not only shot *from* a gun, but *at it*. Many of the most experienced artillerists of this country had been for some time aware that the very fact of the Armstrong guns being so powerful in sending a shot rendered them peculiarly liable to injury from almost trifling blows from without. The Government, as he understood, being perfectly convinced of the justice of these representations, were obliged to institute an investigation, and he wished to ask the Government whether the following questions were true:—Whether the trial was made by throwing grape shot from 32 and 68-pounders at a range of 300 yards, whether sixty rounds were fired in that way at the range of 300 yards, which was the extreme range for grape shot, and only three guns were hit, and whether each of those hits did not prove totally destructive, or did not materially injure the Armstrong guns, which were of various calibres. If that information were true, considering that the test was applied in the most favourable way to the Armstrong guns, the ordinary range for grape shot being 150 yards, and that those guns had proved a signal failure, he would ask the Government whether they did not think a committee or commission of scientific men ought to issue for the purpose of ascertaining the reasons for these failures. Some 5,000 artificers were employed in making the Armstrong guns at a cost of some 10,000*l*. weekly, and if the system went on without further enquiry, and the guns should turn out to be an utter failure, that would be an immense cost to the country in wages alone.

Mr. OSBORNE said the question was important, and as the House was about to separate an answer was due from the right hon. gentleman, the Secretary of War, to his noble friend. He thought the House should take into consideration, before separating, the enormous sum of money that had been expended on a weapon that was not yet proved to be effective. The fact was, that at that momont they were not in possession of a naval gun that would answer their purposes. A gun recently tried with 25lb. powder had burst, and he asked the right hon. gentleman why he would not appoint a committee of skilled officers and mechanicians to enquire into the construction of the gun, and satisfy them of the cause of failure?

Sir G. C. LEWIS said that he had carefully considered the question put to him by the noble lord the member for Chichester, and he could only repeat the answer given by him on a previous day, that the select ordnance committee seemed to him quite sufficient for the purposes they had to effect. His noble friend said the Armstrong gun had been proved to be a failure; that was an assertion very easy to make, but he (Sir G. C. Lewis) knew that it had been proved to be successful.

Mr. OSBORNE: Where?

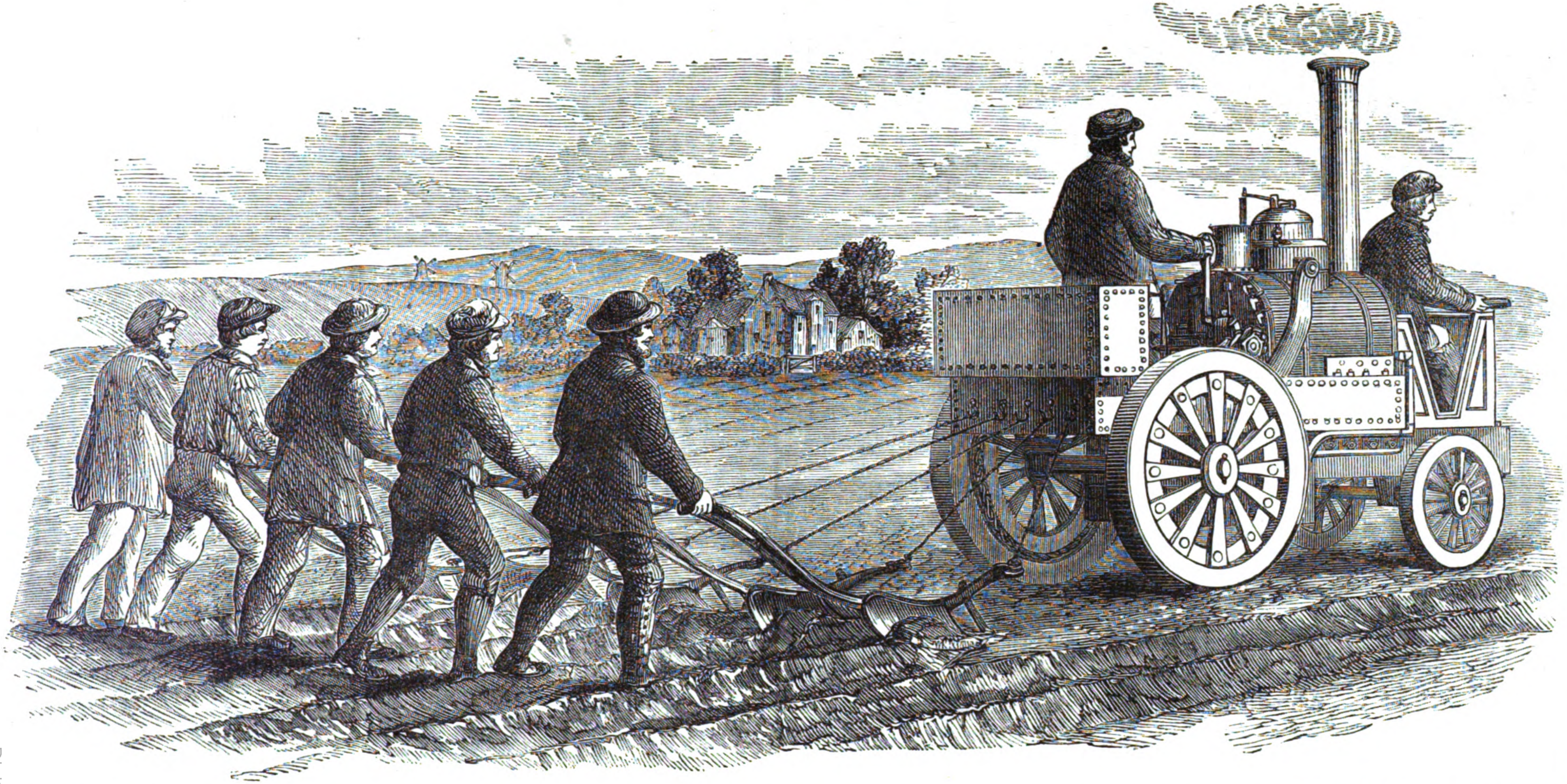
Sir G. C. LEWIS: In the experiments that have been made.

Mr. OSBORNE: As a naval gun?

Sir G. C. LEWIS: The Armstrong gun, as a naval, field, and garrison gun, has been proved to be the best gun hitherto produced. He did not deny that improvements might be introduced, but to describe the Armstrong gun as a failure seemed to him to be an entire distortion of the facts. A committee had already enquired into the subject, and professional witnesses competent to give an opinion were examined. He had recommended that the committee should be re-appointed next session, and that should satisfy the House that this important subject was not lost sight of by the Government.

Mr. MONSELL said that it was admitted that they had no gun at present that could do serious injury at 200 yards to an iron-plated ship. That was the reason the hon. member for Liskeard said the Armstrong gun was a failure. He meant to say that it did not effect all that was necessary to be done for the efficiency of the service. It was well worthy the consideration of the department in charge of this matter, whether some steps should not be taken that would admit the scientific intellect of the country to devote itself to this momentous subject in the most practical and efficient manner.

GILES'S STEAM BULL.



In order to render intelligible the peculiar construction of this engine and the difference between it and all other engines which have been invented for the purposes of road and agricultural traction, we must examine the character of that mechanical effort which constitutes the drawing power of an animal. The principle is the same in both the biped and the quadruped; but is more simple in application and more easily recognised in the former than in the latter. When a man undertakes to draw anything behind him, or to push anything before him, he throws the weight of his body forward, and the amount of propelling or drawing force which he exerts is due to the angle of inclination which the body assumes (measuring from the resting-point, the foot). The purpose which the foot effects in this effort is not that of *traction* but of supporting the weight of the body in such a position as may most effectually develop the tractive power due to *gravity*. The muscular power is employed to constantly maintain this position, and it acts in a line directly between the foot and the centre of gravity. It therefore is not the foot which draws; but the drawing power is derived directly from the weight of the body thrown forward in the direction in which the drawing power is expressed. If a man were forced to stand upright, that is, if the centre of gravity of his body were perpendicular to his foot, he could exert no pulling force, and it is the same with the quadruped.

All engines previously constructed have had their tractive efficiency based alone on *friction*; that is, the centre of gravity is brought over the driving wheel, and the adhesion to the surface (over which the engine travels) is due solely to the hold which is afforded by the circumference of the wheel rubbing against the ground.

In Giles's engine the direct agent of traction is gravity, friction being used only as a foundation on which to develop a far higher and more efficient principle of adhering to the surface of the earth. The wheels of the engine merely carry its weight, while the tractive effort is the combined operation of the two forces in action, viz., the power of the steam and the law of gravity.

The application of this principle to the science of locomotive mechanics opens up an entirely new field for the enterprise of engineers, as well as the capital and industrial interests of the nation, only limited in its extent by that of the untilled and untrodden world. By its agency iron and steam can overcome all tractive operations now performed by animal labour with the utmost reliability and success.

An engine constructed on this principle can now be seen in operation on application to the inventor,

John Giles, 69 Basinghall Street.

HOT-WATER CIRCULATING APPARATUS FOR WARMING PURPOSES.

By Mr. Purnell.*

FIG. 1

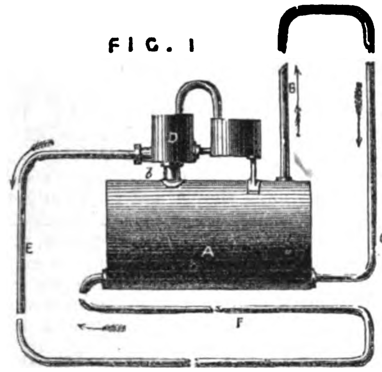


FIG. 2

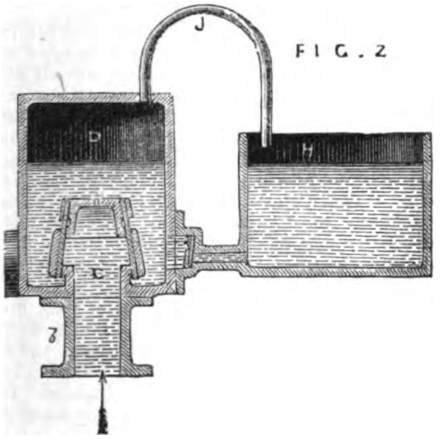


Fig. 1 is a diagram, and fig. 2 is an enlarged section of the principal part of the apparatus.

Ordinarily, hot water is made to circulate through pipes by placing the boiler A, fig. 1, at the lower end of a range of pipes, B and C. The water in the boiler, and in the pipe B, from the top of the boiler, becomes heated, and slightly lighter than that in the return pipe C, which communicates with the bottom of the boiler. The cooler and heavier water tends continually to displace the warmer and lighter, and a circulating current in the direction of the arrows is thereby induced and kept up. In this arrangement the pipes are entirely, or for the most part, above the level of the boiler; but if the pipes were for the most part below that level, the circulation would not (with ordinary arrangements) take place, as the warm lighter water in the descending branch could not force up the cold heavier water in the ascending return branch.

It is often extremely inconvenient to find a proper place for the boiler sufficiently below the general level of the pipes; and some simple means to cause circulation to take place in pipes on or below the level of the boiler has been a great desideratum.

In Mr. Purnell's arrangement, a pipe, *b*, from the top of the boiler, A, communicates with a valve box, D, from which there proceeds the descending or out-going branch, E, the ascending return branch, F, communicating with the bottom of the boiler. In the box, D, there is a pair of simple, freely-working clack-valves, G, which the water has to lift in passing from the boiler to the branch E. To keep up the supply of water, there is a cistern, H, communicating through a clack-valve with the box, D; and this cistern may itself be kept full by an ordinary float-cock on a service pipe. The box, D, is open to the atmosphere by the pipe, J, which is bent over to the cistern merely to catch any dripping from condensed steam.

The working model was contrived so that it could be arranged with either the old or the new arrangement, and it was shown that with the old arrangement no circulation took place in the pipes, whilst with the new plan a regular continuous circulation was at once established, the pipes being below the level of the boiler in both cases.

After trying a great many different plans, the present one was at length arrived at by Mr. Purnell; but it is not easy to explain how the action takes place. In the working model the box, D, was formed with glass sides, through which it could be seen that the valves did not remain steady, but were in a continual tremor. Indeed, without an intermittent action it is difficult to conceive how the result obtained could be produced. The opening of the valve indicated a temporary increase of internal pressure, which would give the water a tendency to leave the boiler by both branches, E and F. If the water were previously quiescent, the exit would actually be freer by the return branch F, the valves obviously offering some slight resistance the other way. If the water were already in motion in the pipes, the tendency would take effect in slightly retarding the entrance of the water into the boiler by the return branch F. The next step of the action is the closing of the valves, which must be due to a diminution of the internal pressure, and the water must tend to return into the boiler, but being prevented from returning by the valves by the branch *b*, must do so entirely by the branch F, and so the circulating current is gradually established. The intermittent variation in the internal pressure has yet to be explained; but it appears that, however regular the fire is, the intermittent or pulsating action exists. The model boiler was heated by a gas jet, the heat from which is perhaps as regular as can be obtained.

In reply to enquiries, Mr. Purnell further explained the details of his apparatus, and stated that he had it in operation on a large scale in different warehouses in Glasgow, and also in garden hothouses. A very convenient application of it was where it was wanted to heat a single flat of a building. Formerly the boiler had to be placed in the flat below, which might be occupied by a different tenant; but with his arrangement the boiler might be placed on the same flat with the pipes below it near the floor, and even beneath the floor, where required.

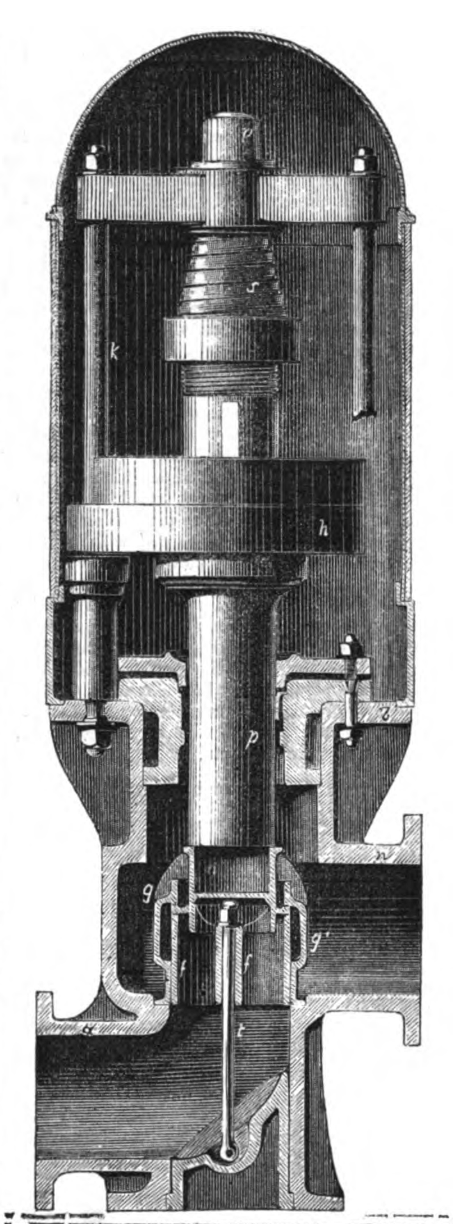
* Paper read, and a working model shown in operation, at the Institution of Engineers in Scotland.

HUSBAND'S IMPROVED WATER-VALVE.

Engines for pumping or forcing water are frequently subjected to great danger by reason of their load being suddenly withdrawn, either on account of the bursting of pipes or breakage of their joints, or other causes, the consequence of which is, that the working parts of the engine and pump being unexpectedly relieved from the opposing pressure of water on the plunger, acquire a velocity of motion sufficient to cause serious damage and destruction to the entire machinery.

The invention illustrated below, which has been recently patented by Mr. W. Husband, of Hayle, Cornwall, has for its object a means whereby, in the event of the accidental removal of the load from the engine, another load is substituted, which controls the speed of the engine and prevents the results above mentioned.

At a short distance from the engine, and to the pipe leading therefrom to the main along which the water is to be forced, an elbow joint *a* is to be bolted, on the upper part of which, by means of suitable flanges and bolts, a bed plate *b* is fixed, on which four standards *k* are secured at equal distances apart, their upper extremities being firmly fixed in position by means of a crosshead *c*, which is provided with a slot in the centre, in order to allow of the vertical movement of the guide rod of a plunger *p*, which passes down between the standards and through a stuffing box on the bed plate into the upper portion of the elbow joint, around the interior of which, on a level with the upper portion of the pipe from the engine, the stationary parts of the valve are fixed, consisting of vertical arms or plates, on the top of which a circular ring or plate is secured, having its opening situated directly beneath the plunger



or pole, which is made so that it may, when desired, fit thereon and form a water-tight joint. Above this circular plate, or what may be termed the bed on which the plunger or pole descends, and bolted or otherwise secured to the sides of the plunger, are four or six arms *g*, of a curved form, which extend outwards and downwards beyond the plate, in order to be attached to the vertical slides of the valve, which are thus opened and closed simultaneously with the valve which the area of the lower surface of the pole forms with the circular plate, which latter is to be furnished with arms, brackets, or other supports extending from its lower surface near the opening to the edge of the pipe, or to the lower portion of the fixed vertical slide valves.

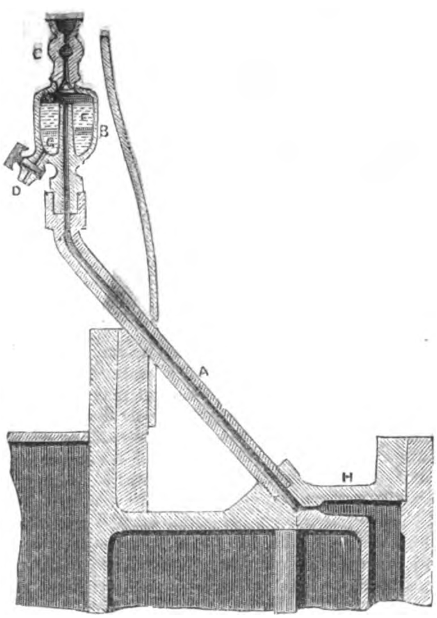
The operation of the apparatus is as follows:— When the engine is to be started, or when the pressure of the water in main idea is ascertained, the pole or plunger is to be weighted as follows:—It is provided at a short distance above the stuffing-box with a fixed circular table *h*, to sustain a series of weights *i*, in the form of discs, having a channel cut therein, which enables them to be placed around the pole one on the other. The table has four projections furnished with slots, which enable it to slide vertically on the standards by the action of the pole, and it is controlled in its descent by means of a flange covered with india-rubber, on each of the standards a short distance below the projections, whereby the jar caused by the sudden

descent of the table and pole is modified, thereby relieving the valve from unnecessary shock. The table is to be weighted so as nearly to equal the pressure of the water upon the area of the pole or plunger; the consequence will be that the pole and system of valves will be raised by the pressure of the water, and a free opening will result for the passage thereof from the engine along the main pipe *n*; but in the event of any accident occurring to the main pipe, whereby the pressure of the water is suddenly taken away from the engine pump, and which would, in the ordinary course of operations, entail such a rapid motion of parts as to cause destruction to the machinery, the pressure is instantly removed from the area of the pole or plunger, which then descends and closes with it the system of valves, thereby throwing the whole load of the weighted plunger upon the engine and pump, and controlling them from the destructive speed they would otherwise acquire.

The plunger or pole may be used in conjunction with the circular plate, and form a valve, without the addition of the vertical slide valves; in some instances where there is not much pressure of water, or where the size of the pipes is small; and the elbow joint may be dispensed with in these instances. The stationary parts of the valve are to be held in position by a screw bolt or rod and nut *t*, as shown. A spiral spring *s* is adjusted to the upper part of the pole, and bears against the under side of the cross-head, thereby easing and assisting the motion of the plunger and valves. The entire apparatus may be enclosed in a casing, with a cap or cover, as represented on p. 67, which may readily be removed when it is required to lubricate or repair the parts.

LUBRICATING APPARATUS FOR LOCOMOTIVE AND OTHER STEAM ENGINES.

By Mr. Patrick Stirling.*



The object of the lubricating cup is to feed oil gradually to the slide-valves of locomotive engines working under high pressure steam. The lubricating cocks generally in use deliver their contents in a few seconds, and the oil or tallow let in is necessarily blown away rapidly, and the valves and cylinder faces left to work dry after a very few strokes.

Mr. Stirling's attention has been drawn to this matter from the frequency of valves and cylinder faces getting cut up, particularly the upper edges, where there is a difficulty in getting oil applied; and to diminish this evil and provide a remedy, this lubricating cup was designed.

The engraving shows a section of the cup as applied to the valve-casing of a locomotive engine cylinder. The syphon-pipe, A, between the cup, B, and the edge of the slide valve, I, is open throughout. The top of the cup is furnished with an ordinary stop-cock, C, for the purpose of filling it with oil. It will be seen that the steam when let on to the valve-casing, H, has free access to the top of the cup, which immediately acts as a surface condenser, and the water, G, so formed collects slowly in the cup, and by reason of its greater specific gravity descends below the oil, F, and by raising it to the top of the syphon-pipe, A, causes it immediately to flow down the tube to the upper edge of the valve.

Cups of this description have been in use for some time past, and have been found to work well. The time occupied in emptying out the oil has been half an hour.

The small cock, D, at the bottom of the cup, is for emptying the water after the oil is exhausted.

It is evident that the lubricator can be made available in a variety of situations, and also that its powers of delivery can be increased to any extent by enlarging the size of the cup.

The advantages to be derived from this lubricator are chiefly the extended period during which the oil is delivered, which has the effect of keeping the slide-valve and cylinder perfectly well lubricated, and the valves are much more easily driven, and therefore the tear and wear upon the valve gearing is greatly diminished.

Mr. Stirling stated that the invention was not patented, and that he would be happy if anyone would make use of it.

* Paper read at the Institution of Engineers in Scotland.

CAPTAIN CUNNINGHAM'S METHOD OF PROTECTING SCREW-PROPELLERS.

Mr. H. D. P. Cunningham, the inventor of the "Cunningham system of reefing topsails from the deck," has just completed a patent for protecting the screw-propeller from fouling or entanglement by hawsers, ropes, &c. There can be no doubt but that the danger of entanglement of the screw-propeller of a war steamer is a very valuable point in her character, and it is possible that mechanical means could be designed for purposes effecting the fouling of the screws of war steamers in action. Once render a ship of this kind motionless, and her condition would be of a very helpless kind, especially should she not be provided with masts and sails, as it is contemplated in the case of ships on Captain Cole's plan. Means, therefore, for protecting the screw from fouling appear to be an indispensable provision for war steamers, and yet, curiously enough, this consideration appears to have been almost neglected. Our war steamers are without any means for protecting their screws. Mr. Cunningham appears to have had this point particularly in view when he designed his apparatus. He alludes in his specification to two modes of carrying out his design. One consists of a very simple application for protecting the screw from hawsers or underlying ropes — that is, ropes or hawsers extending under water at such a depth as, when run over by the ship, especially in a fore and aft direction, are instantly fouled by the screw, and hawsers purposely laid out at or near the surface of the water for fouling the screw of an enemy's ship of war. The other arrangement contemplates the protection to be of a more complete character, such as for protecting the screw against wreckage alongside caused by the falling of masts, &c.

Nothing can be more simple than the first of these plans. Upon the after stern-post, or dead wood, Mr. Cunningham places a radius bar working upon joints fixed to the post. The end of this bar is bent round to accommodate it as nearly as possible to the shape of the tuck of the stern, and when turned off, enables the apparatus to be dipped below the axis of the screw. One or more chains extend from the end of this bar forward to where the run of the ship commences. Another chain stretches up to the counter, acting as a suspensor to the bar when lowered down; another extends from the extreme of the curved end to the heel of the stern post, whilst another extends up over the stern. Thus the screw propeller is enclosed in a guard in every direction against the approach of a hawser or rope. When not required for use, as for example at sea, and no chance of encountering ropes, &c. in the water, the radius bar is triced up, and, being made of flat iron, lays up and down the stern post, offering little or no impediment to the progress of the ship. The action of the raising of the bar raises also all its attachments out of the water, so that the ship is as free from impediment as an ordinary vessel. Nothing can be more simple and apparently effective than this application against the particular cause of fouling a screw — a cause, by-the-by, also of frequent occurrence to merchant steamers going in and out of docks and harbours, which are frequently detained a tide by taking up an underlying and unseen warp in their propeller, but which, by Mr. Cunningham's most simple application, can steam out of any dock, however fouled with warps and hawsers, with perfect safety.

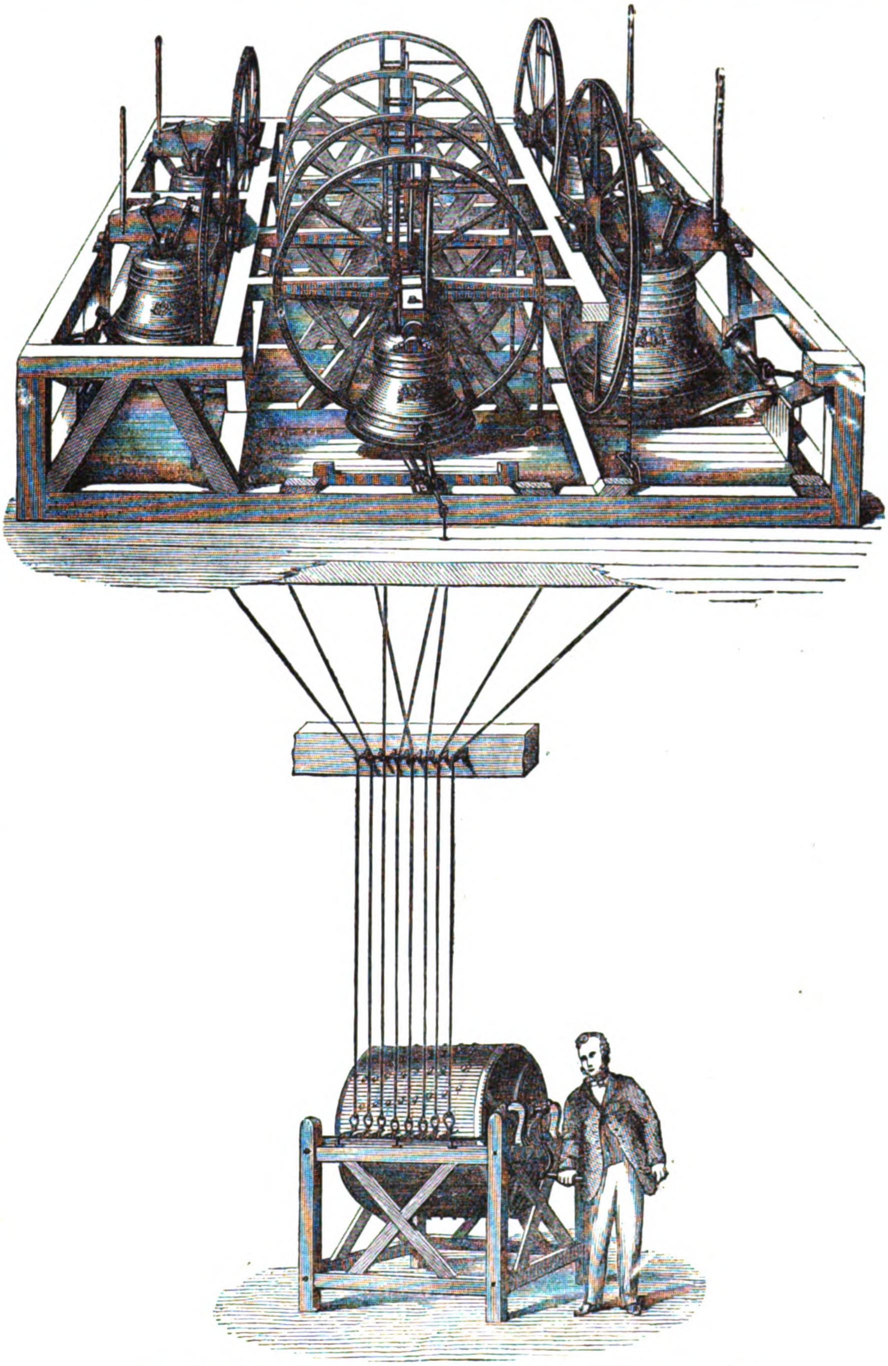
The other arrangement alluded to consists in applying a netting, or an increased number of chains or flexible bars to the means already described, and which additional applications are removed out of the water when not required for use by the same action of the radius bar. The protection afforded by these additions is very complete, and Mr. Cunningham contemplates that, in the event of a ship losing a mast either in action or otherwise, the wreckage will be effectually kept clear of the screw. It is generally supposed that the cutting away of the mizen-mast of the Prince screw steam transport in the memorable gale off Balaklava was the cause of the loss of that ill-fated ship. It was known they were using their steam power at the time to ease the cables, and it is believed the rigging was instantly taken up by the screw, which was thereby rendered useless. It has also been believed that, at the time the masts of the Royal Charter were cut away, she was easing her cables with the screw, and the assistance of which ceased by the rigging fouling the screw. In action, too, the loss of masts would create the greatest possible danger to the screws, not only to the ships losing the masts, but also to other ships present running into the wreckage. The subject, therefore, taken up by Mr. Cunningham is an important one, and the simplicity of the means which he provides for accomplishing his object encourages the belief that his plan is a practical one, and that it will be attended with success. The trials already made in a small screw vessel at Portsmouth are reported to have been very successful.

NAVAL REFORM.

On Tuesday evening last, in the House of Commons, Sir M. Peto moved that, in the opinion of the House, it was the duty of the Government to prepare a measure for the reform of the naval administration. The commissions and committees which had sat since the Crimean war on almost every department of the navy showed that great dissatisfaction existed with the present naval administration, and that some change was necessary; and many speeches which had been made in that House testified to the same effect. The Government had no choice but to consent to the select committee on naval administration, which examined thirteen witnesses and published their evidence, but made no report. Not two of the official witnesses agreed; but the non-official naval men all agreed on one point, that the present system of naval administration was hopelessly and irredeemably bad. The first and chief witness, the Duke of Somerset, gave reasons for and against the enlisting system, and thought the balance to be in its favour. The right hon. baronet further quoted the evidence of Sir J. Graham, Sir F. J. Baring, Sir Charles Wood, and Sir John Pakington; and then, summing up, he said that Sir J. Graham was in favour of the existing system; Sir F. Baring favoured a board which, however, he said, might mean anything; Sir Charles Wood

was in favour of the existing system, with power vested in the First Lord to remove the junior lords and to abolish the secretaryship; and Sir J. Pakington was entirely opposed to any board, and he approved of the entire system. After quoting the evidence of several admirals, the right hon. baronet said, that in the thirty years ending in 1859, there had been seventeen changes of the First Lord, the average duration of the term of office of each lord being one year, ten months, and two weeks; and the total number of changes, including that of the secretary, was 103. In the last eight years there had been five changes in the office of First Lord, and thirty-four amongst the junior lords. How was it possible for persons holding office for such short periods to become acquainted with their business? There had been a committee upon dockyards, none of whose recommendations had been carried out. During the last fourteen or fifteen years, he had had to do with works which involved the expenditure of 49,000,000*l.*, and considering he had had experience in the organisation of large establishments, and, having gone through the dockyards, he declared that it was impossible that anything could be worse administered in a commercial point of view. The right hon. baronet then contrasted the naval administration of France with that of this city. The Emperor appointed a committee, which sat up to 1852, whose report of 1,500 pages he (Sir M. Peto) recommended to the attention of the Admiralty, and whose recommendations the Emperor had liberally carried out. That report declared that a country with less resources than England, if they were properly organised, would prove the victor on the day of trial. The Minister of Marine and the Marine Constructor of France were selected solely for their ability. The latter officer was the first to call attention to the impending change from wooden to iron navies. One vessel was built in France on trial, and ten then ordered like it; but, in England, the Warrior and the Black Prince having been built, ten or twelve of different descriptions had been ordered that it might be seen which was the best. The French committee also made recommendations as to dockyards, which were being carried out. After the return of the two Houses from Cherbourg, Lord Derby passed the severest censure on the Admiralty by forming another board, on whose report ten first-class wooden vessels were added to the fleet. (Hear, hear.) The extraordinary thing was, that, in the teeth of statements made in the report, such a recommendation should have been made and then acted upon. Such a state of naval administration must command the execration of the navy. The evidence further showed that there was no science in the Admiralty. Sir Baldwin Walker and Admiral Robinson had abundantly proved this. Then there was also a great deal of patronage at the Admiralty.

At this point the Speaker's attention was called to the fact that forty members were not present. Only thirty-two members being found present, the House stood adjourned at twenty-five minutes to eight o'clock.



A Peal of Eight Bells, with Chiming Apparatus attached, as exhibited in the Transept of the 1862 International Exhibition.

WARNER'S BELL-CHIMING APPARATUS.

Messrs. John Warner & Sons, bell and brass founders, 8 Crescent, Cripplegate, having had frequent enquiries for a machine by means of which a peal of bells might be chimed by one man, have recently manufactured an apparatus for this purpose, and which is now exhibited by them in connection with a peal of eight bells in the South-East Transept of the International Exhibition. The size of the largest or tenor bell is 48 inches, its note E, and its weight about 18 cwt. 3 qrs. 20 lbs.; the whole peal weighs about 86 cwt. The chiming apparatus, which is fixed in a pit sunk beneath the floor, consists of a drum made of bars of wrought iron, about ¼ inch apart, and between these are fixed a number of tappets or teeth. When the drum is made to revolve by means of the handle and screw, these tappets catch and draw down the wrought iron levers which are fixed on the frame of the apparatus, and which are connected with wires to the spring hammers fixed on the bell-frame. The levers being drawn down, the hammer is raised, and falls when the tappet releases the lever. With this simply-constructed machine a lad may correctly play a great variety of chimes upon six, eight, or more bells, though he may have no knowledge of musical time. Where required, the apparatus can be made to play several tunes on peals of eight or more bells. This machine is not intended to do away with the manly exercise of ringing, but is adapted for those churches where good and steady ringers cannot always be obtained; and having this idea in view, Messrs. Warner & Sons have so arranged the hammers that they in no way interfere with the wheels or other fittings, but the peal can be rung at any time when ringers can be obtained. From the simplicity of its construction, and the ease with which it can be fixed, it is recommended for our colonies. The peal, with the fittings, frame-work, and chiming apparatus, now in the Exhibition, have been purchased for the cathedral at Auckland, New Zealand. We may also mention that a prize medal has been awarded by Her Majesty's Commissioners to J. Warner & Sons, "for excellent workmanship and ingenuity applied in chiming bells by machinery." The working of the machine can be seen at the International Exhibition, as an attendant is always present, and chimes the whole peal at 12 noon, 3 P.M., and 6.30 P.M.

The same firm who exhibit this peal have recently cast a bell in memory of the late lamented Prince Consort, the inhabitants of Clyst St. George, Devon, having subscribed to purchase a bell for that purpose. Beneath a medallion-portrait of the late Prince runs the following inscription:—

IN MEMORIAM ALBERTI .
CONSORTIS . REGII .
PII . BENEVOLI . DOCTI .
BONARUM . ARTIUM . PATRONI .
OMNIBUS . DESIDERATISSIMI .
MDCCCLXII . .

BRUNEL'S MISHAPS.

ALTHOUGH Brunel died at the comparatively early age of fifty-three, it is even matter of surprise that he lived so long. He had more perilous escapes from violent death than fall to the lot of most men. We have seen that at the outset of his career, when acting as assistant-engineer to his father in the Thames Tunnel, he had two narrow escapes from drowning by the river suddenly bursting in upon the works. Some time after, when inspecting the shafts of the railway tunnel under Box Hill, he was one day riding a shaggy pony at a rapid pace down the hill, when the animal stumbled and fell, pitching the engineer on his head with great violence: he was taken up for dead, but eventually recovered. When the Great Western line was finished and at work, he used frequently to ride upon the engine with the driver, and occasionally he drove it himself. One day, when passing through the Box Tunnel upon the engine at considerable speed, Brunel thought he discerned between him and the light some object standing on the same line of road along which his engine was travelling. He instantly turned on the full steam and dashed at the object, which was driven into a thousand pieces. It afterwards turned out to be a contractor's truck which had broken loose from a ballast-train on its way through the tunnel. Another narrow escape which he had was on board the Great Western steam-ship, where he fell down a hatchway into the hold, and was nearly killed. But the most extraordinary accident which befell him was that which occurred while one day playing with his children. Like his father Sir Marc, he was fond of astonishing them with sleight-of-hand tricks, in which he displayed considerable dexterity; and the feat which he proposed to them on this occasion was the passing of a half-sovereign through his mouth out at his ear. Unfortunately, he swallowed the coin, which dropped into his windpipe. The accident occurred on the 3rd of April, 1843, and it was followed by frequent fits of coughing, and occasional uneasiness in the right side of the chest; but so slight was the disturbance of breathing that it was for some time doubted whether the coin had really fallen into the windpipe. After the lapse of fifteen days, Sir B. Brodie met Mr. Key in consultation, and they concurred in the opinion that most probably the half-sovereign was lodged at the bottom of the right bronchus. The day after, Mr. Brunel placed himself in a prone position on his face upon some chairs, and bending his head and neck downwards, he distinctly felt the coin drop towards the glottis. A violent cough ensued, and on resuming the erect posture he felt as if the object again moved downward into the chest. Here was an engineering difficulty, the like of which Mr. Brunel had never before encountered. The mischief was purely mechanical; a foreign body had gone into his breathing apparatus, and must be removed, if at all, by some mechanical expedient. Mr. Brunel was, however, equal to the occasion. He had an apparatus constructed, consisting of a platform which moved upon a hinge in the centre. Upon this he had himself strapped, and his body was then inverted in order that the coin might drop downward by its own weight, and so be expelled. At the first experiment the coin again slipped towards the glottis, but it caused such an alarming fit of convulsive coughing and appearance of choking that danger was apprehended, and the experiment was discontinued. Two days after, on the 25th, the operation of tracheotomy was performed by Sir Benjamin Brodie, assisted by Mr. Key, with the intention of extracting the coin by the forceps, if possible. Two attempts to do so were made without success. The introduction of the forceps into the windpipe on the second occasion was attended with so excessive a degree of irritation, that it was felt the experiment could not be continued without imminent danger to life. The incision in the windpipe was, however, kept open, by means of a quill or tube, until May 13, by which time Mr. Brunel's strength had sufficiently recovered to enable the original experiment to be repeated. He was again strapped to his apparatus; his body was inverted; his back was struck gently; and he distinctly felt the coin quit its place on the right side of his chest. The opening in the windpipe allowed him to breathe while the throat was stopped by the coin, and it thus had the effect of preventing the spasmodic action of the glottis. After a few coughs the coin dropped into his mouth. Mr. Brunel used afterwards to say that the moment when he heard the gold piece strike against his upper front teeth, was, perhaps, the most exquisite in his whole life. The half-sovereign had been in his windpipe for not less than six weeks! — "*The Brunels,*" *in the Quarterly Review.*

TO CORRESPONDENTS.

S. K. T., E. G., Dr. W. B., W. W. Jun. (all right), J. N., J. H. D., W. W., Capt. N., J. H., R. W. E., Sir J. R., W. T.

Correspondence.

[*We do not hold ourselves responsible for the statements of our Correspondents.*]

THE STRAIGHT LINE *VERSUS* THE WAVE LINE FOR VESSELS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—I do not wish to say anything uncivil, but I am constrained to request that Mr Moy would turn over the defence of the wave-line theory to some one more competent to discuss it, who can at least appreciate a mathematical argument, and not call it assertion. In the interest of truth and science in the abstract, but far more importantly in the interest of the practical science of ship-building, it is desirable, or rather it is a matter of the greatest consequence in the latter aspect, that this question of the propriety or impropriety of moulding the bows of vessels with hollow lines should be settled, one way or the other, I care not which. I have invited discussion upon the subject, not in reference to any mere assertions of mine, as Mr. Moy supposes, but in respect to the validity of my proof, that the accelerated motion of particles of water produced by hollow lines involves a greater expenditure of power than uniform motion in the same, as produced by straight lines. Scientific men have not yet come forward to dispute it, but it would be a matter for regret if Mr. Moy has stood in the way to prevent them. I have, however, observed that mathematicians, such as Mr. Macquorn Rankine and Dr. Woolley, for some reason or other, have appeared desirous of evading any decided expression of their thoughts on the subject, even when it has crossed their path; and yet I cannot but think that on such occasions it is only what we might expect from them, either to condemn or to give their hearty approbation to the theory, unless, indeed, they felt that they could not get up an opinion upon it, one way or the other. Respect and friendship are excellent things, and they have not been without influence upon myself, but no one sooner than Mr. Scott Russell would be ready to acknowledge that the public welfare is paramount.

The adoption of hollow lines is rather prevalent, and it is much to be regretted that it should be so, if the practice is bad. I admit, however, that it is just possible the practice is right, and that it is Mr. Russell's theory only which is bad. But then my theory must be bad also. Well, that does not necessarily follow; it may be deficient merely in the non-appreciation of obscure points in the physics of the subject, but which in practical results might override the tendency of what in the abstract is demonstrably true, and so bring about a contrary issue. It is this which is so frequently the cause of the discrepancy between practice and theory, and, along with other reasons, will ever justify caution, not to say suspicion, in regard to conclusions claiming to be rigorously and mathematically exact, if out of "the region of pure intellect." Now my proposition is, that whenever, as to *work*, the element of resistance increases in any ratio with the velocity, the addition of velocity avoidable under the given circumstances is a waste of power. And again, that water coerced into motion obliquely by a curved surface does impart that needless velocity; ergo, power is wasted, and the practice, as tested mathematically, is bad. But, nevertheless, is the practice bad? The argument, in its premises, and also in its conclusion, so far as the waste of power is concerned, is, I believe, unassailable; but as to the practical issue, might not a saving of power accrue in other respects from hollow lines which would more than compensate the loss? Might not, for instance, a less number of particles of water be put into motion? I do not believe that this can be proved, but I am desirous of learning what can be said on the subject; and no other course that I can conceive is open to the advocate of the wave-line theory.

Mr. Moy will excuse me from noticing his observations on uniform motion; they are, I can assure him, random remarks, without pertinency or point.

BENJAMIN CHEVERTON.

July 28.

THE ADMIRALTY, THE WAR-OFFICE, AND INVENTORS.

SIR,—Mr. W. Austin, C.E., in your last number, has ably exposed dereliction of duty by officials in the Admiralty. When, in the spring of 1826, at Richmond Barracks, Dublin, I practically proved the efficiency of my rifle percussion shell and elongated expanding shot, in presence of General Sir George Murray, at that time commander of the forces in Ireland, and numerous officers of the garrison, I obtained of him leave of absence to proceed to Woolwich, in order to prove the efficiency of my invention to the Select Committee there, Sir George observed to Colonel Farent, the Commandant of my regiment, the 34th, "The Committee will order answer No ... to be given to his invention."—I am yours &c.,

J. NORTON.

International Hotel, Bray, July 29.

Gossip.

On Saturday, the 21st of June, a respectable number of people collected at the Club House, Jersey City, U.S., to witness some experiments with Duffy's submarine gun. This gun is the invention of Joseph Duffy, of Paterson, N. J. The gun is placed on a deck in the vessel as far as possible below the water line, with the muzzle end passing through a stuffing box in the vessel's side. Mechanism is so arranged that when the gun is forced inboard by the muzzle coming in contact with the side of a hostile ship, the gun is discharged, sending not merely the shot, but also a considerable portion of the expanding gases, into the hold of the enemy's vessel. Valves are provided to prevent the ingress of water as the gun is driven inboard by the recoil. A small model was provided for the experiment, and was placed in the bow of a skiff, about 20 inches below the surface. The boat was rowed stem on against an oak target; and as the gun struck it was discharged, driving the shot through two 3-inch planks, and considerably shattering the target. The result was entirely satisfactory.

IRON SHIPS.—A correspondent of the *Devonport Independent* says:—"The condition of our iron ships, as from time to time they are brought under examination, is a subject for our gravest consideration. It was but a short time since we directed attention to the state of the plates of the bottom of Her Majesty's ship Triton, now being repaired in Keyham Yard, which were found to be so corroded by rust from the outside as to render it imperatively necessary to remove a large number of them. We have now an instance of the presence of the same insidious destroyer attacking an iron vessel on the inside, while externally she exhibited no symptom of decay. While the labourers in this yard, a few days since, were scraping the bottom of Her Majesty's steamer Princess Alice (the Admiral's tender at this port), a month or two since, a tender to Her Majesty's yacht, they found that in some places the scrapers went through the bottom; and on further examination it was discovered that the damage occurred to a considerable extent immediately under her cylinders, a part of the ship where, if the water had rushed through at sea, there would have been no means of stopping it, and the ship must have gone down. It was providential that the evil was detected in time. The shipwrights of the yard (and not boiler-makers) are employed in making good the defects by means of iron plates."

The Cape (Eastern province) Railway proposes an increase of its capital from 600,000*l.* to 1,200,000*l.* Its object, as the prospectus states, is "the construction of such railways in the Eastern Province of the Cape of Good Hope as the Colonial Government may sanction, under a guarantee of a minimum rate of interest of 6 per cent per annum."

The catalogue of the special exhibition of works of the Mediæval Renaissance and more recent periods, on loan at the South Kensington Museum, is now published, price one shilling.

In the House of Commons, on Monday night, Mr. Laird asked the Secretary to the Admiralty if the Admiralty had decided to build or alter any more timber vessels to be cased partially with iron-armour plating on Mr. Reed's plan until the Enterprise, now being altered, was completed and tried.—Lord C. Paget replied that one vessel was now being built upon the plan proposed by Mr. Reed, but he could not make any statement with respect to the future intentions of the Admiralty.

According to accounts received from Mr. Lange, the Suez Canal works continue to be pushed on with vigour. The breakwater at Port Said, which presented some difficulties, is now completed, and vessels are able to discharge their cargoes in all weathers. The jetty is being continued. Between the breakwater and the shore there remain about 1,800 yards to fill up, and the cargoes of large stone blocks daily sunk in the sea from the quarries at Mex are sensibly diminishing this distance. On land the progress in excavating the canal is alleged to be greater than is generally imagined. 25,000 men are engaged along the line, and the average quantity of earth removed is about 550,000 cubic yards per month. It is expected, therefore, that the works will soon be sufficiently advanced to allow the waters of the Mediterranean to flow into the basin of Lake Timsah. Meanwhile, a town is being constructed at Timsah, and workmen are employed in laying down the foundation for the quays intended for vessels to load and unload.

A telegram received on Monday announces the successful submersion of the first portion of a new telegraph cable between England and Holland. Owing to the increase in their message traffic between this country and the continent, the Electric and International Telegraph Company entered into a contract with Messrs. Glass, Elliott, & Co., of Greenwich, for a new line to be laid between Lowestoft and Landvoort. The steamer Hawthorne shipped 48 miles of the cable last week, and the whole was successfully paid out, under the superintendence of the engineers, Messrs. Canning and Clifford, and the electricians, Messrs. de Sauty and Saunders; the electrician of the Telegraph Company, Mr. C. F. Varley, being also on board. The cable is the heaviest yet constructed, and contained four conducting wires. The English shore end (15 miles) weighs no less than 16 tons per mile, and is above two inches in diameter. The remaining portion will be shipped immediately.

A Turin letter of the 16th July says:—"Two steam advice-boats, of 400 horse-power each, are now being built in England, and 4 iron-cased 26-gun frigates have been ordered in France. A contract has been signed with an English house for the construction of a ram vessel of 8 guns, of force enough to cut a line-of-battle ship in two. Contracts have been also entered into for the supply of all the projectiles of which the navy may stand in need. A purchase has been made of 3,000 revolvers and 10,000 rifles. The port of Ancona has been put in a complete state of defence; it contains 25,000 tons of coal and forty flat-bottom barges, each with two frigate anchors. The arrival of 300 pieces of cannon purchased in Sweden is expected in a few days, as well as 100 rifled cannon for the use of boats. The fine corvette Magenta, built at Leghorn, is about to be iron-cased, and the necessary plates have been purchased for three frigates now on the stocks—the Gaeta, Messina, and Prince Carignan. Fifty cannon have been purchased in America for the iron-cased frigates which are being built in that country for the Italian Government. Contracts have been signed for the supply of ship timber for this and next year."

A company has just been formed for providing a line of Express passenger steam-boats upon the Thames between Chelsea and Gravesend. These boats will be rather a novelty upon our river, as regards elegance and convenience, and will, we should think, attract a considerable portion of the passenger traffic from the over-crowded streets. In fact, to have accomplished this long ago, it was only necessary to have a line of vessels that would have pleased the passengers as well as paid the proprietors. If the new company study the one object sufficiently, they will accomplish the other also. The vessels plying above bridge at present are said to pay their small number of shareholders handsomely, and there can be no doubt but the new company will realise adequate profits, while their express passenger boats will be a great boon to the public.

On Tuesday Lord Bury announced that Her Majesty had assented to the appointment of a royal commission, in accordance with Lord Elcho's motion, for enquiry into the proceedings of the Royal Academy.

A company has been formed, under the title of "The Flintshire Lead and Zinc Company (Limited)" with a capital of 150,000*l.*, in 15,000 shares of 10*l* each, for the purposes of smelting ores of zinc and lead, and the manufacture of the products therefrom, on a large scale, in addition to Bennett's patent tinned lead pipes for water service. Extensive and commodious premises have been taken at Bagillt, in North Wales, the vendors having consented to take two-fifths of the purchase-money in shares, and not to receive any dividend until the other shareholders have received 8 per cent. out of the net profits. This property consists of 30 acres of land, held on lease, of which the works cover an area of two and a half acres, on which the necessary buildings for the carrying on the business is erected. The directors have in view the purchase of four other acres on the lower side of the works, and intend making such extensions as shall triple the present produce, which they affirm can be done at a cost of 20,000*l.* in the erection of additional machinery. [In the Mechanics' Magazine of March 21 we gave an illustrated description of Bennett's method of tinning lead pipes, to which we refer the reader.]

Since the burial of the great historian, near the Poet's corner of our national mausoleum, a piece of paper only, with the words "Lord Macaulay's Grave" written upon it, served to show where his remains were deposited. A tablet has, however, lately been placed over the grave. Unlike those recently let into the nave of the Abbey to perpetuate the memory of Mr. R. Stephenson, C.E., and Dr. John Hunter, it is devoid of all ornament, and bears the following simple inscription: "Thomas Babington, Lord Macaulay, born at Rothly Temple, Leicestershire, October 25, 1800. Died at Holly-lodge, Campden-hill, December 28, 1859. 'His body is buried in peace, but his name liveth for evermore.'"

In the House of Commons, on Monday, Lord Lovaine asked whether the electric light, now in use at Dungeness lighthouse, had been successful; and, if so, whether its adoption was to form part of the alterations contemplated by the Trinity Board in the Portland Lights. He also enquired whether there would be any objection to produce Mr. Faraday's reports on the light to the Royal Commissioners, and those made by order of the Trinity Board.—Mr. M. Gibson said the electric light had been exhibited for only a short time at Dungeness, but the result, so far, was encouraging. A proposal had been laid before the Board of Trade by the Trinity Board to reconstruct the lights at Portland, but the matter was still under consideration. There would be no objection to produce the reports referred to by the noble lord.—Lord Lovaine intimated that early next session he should call attention to this subject.

The last exhibition of German manufactures took place in 1854, at Munich. An arrangement had been made that the next should be held at Vienna in 1865. The Austrian Government has now declared its readiness to again give place to Munich, that city possessing all the accommodations necessary for such an exhibition.

The Empress of the French has presented the directors of the Lochlomond Steamboat Company with two splendid vases, as an acknowledgment of her deep sense of the kindness shown to her when she visited Lochlomond in November, 1860. The vases are of fine Sèvres porcelain, mauve-coloured, with burnished gold bands, and beautifully enamelled foliage and flowers, the blush-rose being most conspicuous. Each vase is two and a half feet in height, and three feet in circumference.

The *Derby Mercury* announces the important discovery of a continuation of the coal-field on the Coton Park estate, near the Gresley station of the Leicester and Burton Railway. It is a very valuable seam, of more than 13 feet thick at the depth of 160 yards. The bed of coal is identical with the main beds of the Moira and Gresley collieries.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

The Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

96. G. Hewitt. *Improvements in apparatus used in the manufacture of drain tiles.* Dated Jan. 13, 1862.

For the purposes of this invention, in order that the ends of such tiles may more advantageously than heretofore be made to go together with spigot and faucet joints, one end of each tubular tile is by the improved apparatus cut into the form of a hollow or concave cone, and the other end is cut to the form of a convex cone. The apparatus consists of two hollow conical cutters, one of which is fixed on a suitable handle, the stem of which enters into and fits the interior of the tile which is about to be cut at its ends, in such manner, however, as to allow of its being turned freely therein; as this fixed hollow cutter is caused to be rotated, and is pressed up towards the end of the tubular tile (which should still be only in a partially dried state), the cutter progressively removes the outer end of the tube, the shavings of the clay or brick earth passing through the hollow conical cutter from the interior outward. To facilitate the holding of the tile when being cut at the ends, the tile is placed in a hollow or semicircular trough, one end of which is bridged over with a semicircular arch, the outer surface of which, as well as the outer surface of the invert of the trough, is bevelled off so as to form a concave cone, suitable to admit of the use of the other conical hollow cutter, which is employed to cut the concave conical cut at the other end of the tile. The other end of the hollow trough or holder is formed convex, so that the fixed conical cutter by which the convex conical end of the tube is cut may pass on to the end of the trough or holder. *Patent abandoned.*

97. J. Betteley. *Improvements in ship-building.* Dated Jan. 13, 1862.

For the purposes of this invention, in constructing the ribs or framing of ships or vessels when iron is used planked over with wood, in place of using the sections of iron heretofore employed for the ribs or framing, the inventor employs iron of the following section, viz.:—Iron bars formed flat on the outer side or surface against which the wood is to be fixed, and formed on the inner side or surface with flanges at the edges, so as to give strength to the bars, and so as at the same time to render the inner side or surface suitable to receive the heads or ends of the bolts by which the wood planking is fixed to the ribs or framing. The planks at the outside of this framing are fixed in a direction from stem to stern or fore and aft; then a further planking is used outside or over the first-mentioned planking, and such second planking is to run in a vertical direction from the keel upwards, or it may run in a direction inclined to or diagonally across the previous or fore-and-aft planking; and such outer planking may be fixed to the previous planking by both, or in any convenient manner, and the seams of both the plankings may be caulked. In constructing deck beams and fastenings for wood ships it is preferred to employ two plates of iron kept at a distance apart by hollow distance pieces fixed by passing bolts or rivets through them at intervals along the beam. At each end of the beam the two plates are turned outwards from each other, and between the two plates of which a beam is constructed an iron knee is introduced at each end of the beam, and is fixed thereto by rivets or screw bolts. *Patent abandoned.*

98. T. W. G. Treeby. *Improvements in cannon and fire arms.* Dated Jan. 13, 1862.

In casting cannon the inventor produces the rifling in the following way:—The gun is cast on a hollow tube of the same twist and form as the rifling may be required, and, to prevent the tube being injured, he sends water through it, so that the rifling may be perfect. The tube may be removed or allowed to remain in the gun, and which would form an excellent casing, as the internal and external surfaces are of the same form. If breech-loaders are being formed, he passes a bolt at right angles through the rifling at the breech; if muzzle loaders, he stops the breech by a plug. The other part of the invention consists of a rifling machine. He has a rod or tube similar to the one before named, and by this application he produces a direct action, which is a great improvement over the machines now in use. *Patent abandoned.*

99. J. G. Marshall. *Improvements in the preparation of flax and other fibres previous to being spun.* Dated Jan. 13, 1862.

This invention consists in preparing the fibres of flax, hemp, and other analogous plants, by passing them in a wet state between a series of drawing rollers, to which an increasing draught is imparted, previous to being spun, and where all the fibres are reduced to one uniform length and degree of fineness. *Patent completed.*

100. C. N. May. *Improvements in the manufacture of pastry and in apparatus for the same.* Dated Jan. 13, 1862.

According to this invention the inventor makes the crust separate from the pie, making it of a suitable size to suit the pie dish, and raised in the centre, which form it keeps when

baked and placed on the pie. By this means a nice light crust is produced, and the pie rendered of handsome appearance. For this purpose he employs a plate of metal, or other material stamped up or otherwise raised of a suitable ornamental form, and on this he places the dough or paste, which plate imparts to the paste the raised form desired. *Patent abandoned.*

101. I. Carter. *An improved shaft tug or bearer used in harness.* Dated Jan. 14 1862.

This consists in dividing the tug or bearer, and hinging or jointing the same so as to allow of the shaft being easily placed in the tug and withdrawn therefrom, such tug or bearer being provided with a latch or bolt, whereby the end of the tug may be locked into a catch of brass or other metal or material, and thus form a complete ring, which, however, need not be perfectly circular in form. The tug the inventor prefers to have made of iron, or other suitable metal, covered with leather, and to hinge the one part of the tug to the other by a knuckle hinge, and secure the end by a spring latch of brass or other metal, which catches into a brass catch placed close to the buckle by which the tug is attached to the back band of the harness, having a loop or eye of metal for passing the back band through, thereby doing away with the necessity of passing the back band round the shaft. *Patent abandoned.*

102. E. W. Hughes. *Improvements in engineering and architectural structure.* Dated Jan. 14, 1862.

This consists in constructing cylinders or tubes suitable for columns or supports used in engineering and architectural structures, by forming and combining plates of wrought or malleable iron, each of which is rolled with two other projecting flanges, which are produced at angles greater than a right angle to the plane or outer surface of the plate. *Patent completed.*

103. J. Paine. *Improvements in printing and ornamenting kamptulicon when applied to fabrics.* Dated Jan. 14, 1862.

This consists in printing and ornamenting kamptulicon with waterproof colours after it has been applied to a fabric, and thereby forming a material or fabric suitable for floor-cloths, table covers, shoe stuffs, wearing apparel, and other similar purposes. The inventor also prints or ornaments kamptulicon with non-waterproof colours, and thereby adapts the material to a variety of purposes. *Patent abandoned.*

104. J. Jack. *An improvement in or application to cores for moulding or shaping metals.* Dated Jan. 14, 1862.

Here metallic or other chains are used or applied, either taking the place of the hay, straw, or other fibrous bands entirely, or being used in connection with a small quantity of the said fibrous materials. *Patent abandoned.*

105. M. Chadwick. *Improvements in machinery for folding or plaiting cloth, and for measuring the same.* Dated Jan. 14, 1862.

The object of this invention is the production of machinery for retaining the cloth at each fold in a firm position during the process of plaiting or folding, and for delivering the cloth to the machine as required; and also for regulating the machine for measuring and plaiting various widths of plaits or folds. *Patent abandoned.*

106. W. Gorse. *An improvement or improvements in machinery for manufacturing the cut nails called brads.* Dated Jan. 14, 1862.

This consists in an arrangement of parts for guiding and giving a compound motion to the strip of iron from which nails of the kind called brads are cut. The motion given to the strip consists of the ordinary swivel motion in combination with a side or lateral motion, whereby the strip is carried backwards and forwards, so as to be operated upon alternately by the bell cutters, in conjunction with the bottom or fixed cutters. *Patent completed.*

107. S. W. Marsh. *Improvements in breech-loading fire arms.* Dated Jan. 14, 1862.

This invention is not described apart from the drawings. *Patent completed.*

108. T. Harrison and J. G. Harrison. *Improvements in ploughs.* Dated Jan. 14, 1862.

This consists in adapting to ploughs a pressing wheel and plate combined for performing in one operation the ploughing of the land; and pressing the furrows so produced, so as to form a bed suitable for receiving the seed. *Patent completed.*

109. C. Hill. *Improvements in the manufacture of lubricating compounds.* Dated Jan. 14. 1862.

Here the patentee prepares a pulp or jelly by boiling down "carragea" moss, to which he adds, in certain proportions, flour, yellow soap, tallow, palm oil, lead, and a variety of other materials, according to whether he wishes to produce a thick or liquid grease. *Patent completed.*

110. J. Harris. *A semaphore target marker.* Dated Jan. 14, 1862.

This refers to an instrument for denoting where the bullet strikes the target, at whatever position or angle, and the instrument is composed of a dial with an indicator hand, worked by a winch handle, operated upon the marker; the dial and indicator are placed in such a position, and are so made as to be seen at long distances. A vane and cardinal points with signal flags can be attached when required. *Patent abandoned.*

111. J. G. Marshall. *Improvements in the machinery and processes for producing fibre from woven and other textile fabrics.* Dated Jan. 14, 1862.

The object here is to disentangle the strands of warp and weft of woven and other textile fabrics in a better manner than heretofore, and then to comb or card the strands so as to reproduce the fibre in a more advantageous form for subsequent manufacture than would result from the processes now in use for that purpose. For this purpose the patentee divides the woven or other fabric into strips in a direction diagonal or oblique to the strands of the warp and weft, so that the strands both of warp and weft may be equally acted upon when presented to a cylinder covered with card filleting or other suitable points. The strips cut or divided in this manner are placed on a travelling endless apron and are fed between feeding or holding rollers, which retain or hold them while they are operated upon by a rotating cylinder covered with card filleting or other suitable points, whereby the fibres are combed out or carded as in the usual process of treating wool, tow, and other fibres. He finds it useful to feed the strips on to the cylinder through several sets of feeding rollers, each set consisting of two or more rollers, so as to feed the material on to the cylinder very slowly. *Patent completed.*

112. E. Lord. *Improvements in or applicable to looms for weaving.* Dated Jan. 15, 1862.

This relates to the manufacture of check straps, and consists in applying vulcanised india rubber, &c., thereto, for rendering them elastic, so that, when struck by the picker or picker-stick to propel the shuttle through the shed, they will expand, and be again in the proper position for checking the momentum of the picker or picker-stick. *Patent abandoned.*

113. W. Cleland. *Improvements in treating and utilising certain materials used and products obtained in the manufacture of gas, and in apparatus connected with the said treatment.* Dated Jan. 15, 1862.

We cannot here devote space to the voluminous details of this invention. *Patent completed.*

114. T. Timmins and T. Simmons. *A combination bath.* Dated Dec. 15, 1862.

This consists in so constructing these baths that each shall combine in itself all the advantages of the hot air or Turkish bath, with the vapour, slipper, hot and cold shower bath; and this the patentees effect by constructing the body of the bath of sufficient size and capacity for general use, with a projection at the head, so that when using this bath as a hot air or vapour bath, a pillow may be placed on the projection for the head of the occupant to rest on. Some little way from the bottom they place a strong frame stretched with cane, wire, or other non-absorbent material, for the patient to recline on, and at the sides, when required, they also place frames stretched in the like manner, standing off at a little distance from the sheet-metal sides of which the bath may be composed, for protecting the user from contact from the hot metal. At the foot an air-way is constructed, and a suitable lamp or other heating apparatus for heating air, which is sent into the interior of the bath through the air-way before mentioned. The body of the bath is partially covered over from the bottom end upward, and to this a counterpoise cover is attached, with a close hinge or other joint, so as to form a lid to entirely cover up the bath, excepting at the top end, where an opening is formed for the neck of the occupant, as the body only is intended to be subjected to the effects of the hot air or vapour. *Patent completed.*

115. J. Ridsdale. *Improvements in preparing sheet lead for covering floors, stairs, and other like purposes.* Dated Jan. 15, 1862.

This consists in sinking by pressure from presses, rolls, or hand tools, designs or patterns on that surface of the sheet lead which, when laid, is to come uppermost, and in filling up such sunken designs or patterns with colour or not, according to requirement. *Patent completed.*

116. H. D. P. Cunningham. *Improvements in means for protecting screw propellers from entanglement or being fouled by ropes or other bodies; also improvements in means for closing up the screw propellers.* Dated Jan. 15, 1862.

These improvements consist in affording protection to screw propellers from being fouled or entangled by hawsers, ropes, wreckage, and other bodies, by chains and bars so arranged as to be capable of being removed or raised up out of the water when the protection is not required, in order that they may not offer impediment to the progress of the ship. *Patent completed.*

117. J. Brooke. *Improvements in the form of lubricators.* Dated Jan. 16, 1862.

Here the inventor takes a square hollow box, preferably metallic, having the inner bottom face curved conically, and having a projecting mouth and lip formed in the slide, which communicates with a discharge tube; within this cup or box he mounts a bush or bushes, which are so disposed as to rotate upon an axis always sweeping or approaching the bottom of the cup, and extending and pressing against the lip of the orifice of the discharge pipe each time as it passes during its rotation; oil or other lubricating matter is put in to the box, and motion being given to the axle upon which the brushes are mounted, these take up the oil, and on meeting the lip it is pressed out and falls down the discharge pipe upon the machinery. *Patent abandoned.*

118. J. A. Knight. *The application of a diamond cutter, and improved machinery for operating the same, for dressing millstones.* (A communication.) Dated Jan. 16, 1862.

This consists in the novel construction and arrangement of the different parts of a machine for dressing mill stones. Among the parts are a double guide-way parallel rule, with the means of operating the same, a diamond-cutting instrument with the means of guiding the same, a diamond-cutting instrument with the means of guiding, operating and steadying said instrument, two adjustable steel shields secured in a channel formed in the lower surface of the parallel rule to protect the setting of the diamond, two raised ledges of metal secured to the under surface of the double guide-way forming a channel for the parallel rule to rest upon, and a self-adjusting diamond protector. The invention is not described apart from the drawings. *Patent completed.*

119. E. H. C. Monckton. *Improvements in apparatus for obtaining and applying motive power.* Dated Jan. 16, 1862.

This consists in dispensing with boilers, and in generating steam or vapour in the most rapid manner, by the circulation in small quantities of pure or distilled water, or other fluid, air, or gas, or mercury placed in a reservoir, and pumped or forced simultaneously through one or more metallic tubes, properly supported and stayed and shaped, so as to withstand pressure, which have been heated with coal, coke, or gas &c., and then passing the steam or elastic fluid so generated through the cylinder of an engine, or other apparatus, having thereby produced motive power. The steam or elastic fluid is then passed into a condenser constructed of a series of flattened tubes or flat vessels placed in a cylinder or other receptacle, which are cooled either by a current of air being forced between them by any suitable means, thus circulating above them and then passing through the cylinder or receptacle, or else by water or a shower-bath arrangement added to a blast of air, thus combining the cooling properties of air with those of rapidly vapourised water. The steam, vapour, or gas having become condensed and reduced again to its former bulk, or thereabouts, is repassed into the original reservoir, whence it is again pumped or forced by any suitable means into circulation through the heating apparatus and engine. *Patent completed.*

120. T. Mantaule. *An improved runner fastening for umbrellas, parasols, sunshades, and other similar articles.* Dated Jan. 16, 1862.

This consists in attaching to the stick a pin, staple, or other projection, and in forming in each end of a tubular runner a curved or suitably formed slot, into which the pin or projection passes and locks itself as the umbrella or other article is either opened or closed, being forcibly held therein by the natural spring of the umbrella frame. *Patent abandoned.*

121. W. Tristram. *Certain improvements in power looms.* Dated Jan. 16, 1862.

This consists in the novel application of india rubber or other elastic spring buffer or stoppers to receive the concussion of the slay, to limit its throw, and prevent it beating up more closely sometimes than at others. *Patent abandoned.*

122. H. Wheatcroft. *Improvements in the manufacture of bonnet and cap fronts and similar fabrics.* Dated Jan. 16 1862.

This relates to that part of the manufacture of cap and bonnet fronts called the banding machinery, and more particularly to machinery for banding singles, and consists of a lead or plate mounted upon a suitable frame, the plate being corrugated or triangular on the surface so as to present two ridges, and the under part of the plate is heated with gas. On the upper surface of the triangular faces of the plate, and parallel to them, are laid two small rectangular slips, hinged so that when lying on the angular faces of the plate they form an opening, but when they are raised horizontally the opening is closed. The invention also includes arrangements for opening and closing the slips, and whereby the band is attached to the cap or bonnet front. *Patent completed.*

123. T. Myers and E. Myers. *Preventing rust on bright steel, iron, brass, or metal surfaces.* Dated Jan. 17, 1862.

The patentees, take, say 10 lbs. of gutta percha, 20 lbs. of mutton suet, 30 lbs. of beef suet, half a gallon of sweet oil, two gallons of neat's-foot oil, one gallon of oil of thyme, and half a pint of rose pink, or other suitable perfuming and colouring matter. These ingredients are gently simmered until the whole is dissolved and well mixed together; when cold, the composition is ready for use. *Patent completed.*

124. R. Dunlop. *Improved means for facilitating calculations.* Dated Jan. 17, 1862.

This relates to means for facilitating calculations, and consists in a collection of leaves or strips of paper, parchment, linen, metal sheets, or other material, which should be made up into a book containing a number of leaves, say twelve leaves for instance, and these leaves, each or some of them, divided into a number of sections or smaller leaves or strips by cutting or separating them so that the leaves may range one above the other, or otherwise range together as required. This book contains calculations in money, or it may be used for calculations on other tables. *Patent abandoned.*

125. J. M. Rowan. *Improvements in the construction of steam hammers.* Dated Jan. 17, 1862.

This invention is not described apart from the drawings. The patentee claims constructing movable cylinder steam hammers with slide piston rods, or with steam communication separate from such rods as described. *Patent completed.*

126. B. Moss. *The application of certain material or mixture of such material with clay or substances and for the manufacture therefrom of bricks, fire blocks, and so forth, applicable to the construction of iron furnaces, copper smelting furnaces, and other metallurgical operations, glass house sieges for pots and glass houses, and for the linings of furnaces, also for the manufacture of crucibles for the melting of brass and other purposes.* Dated Jan. 17, 1862.

Here the inventor by preference reduces the steatite to a powder, then moistens it with water, to which in some cases it is preferred to add a weak solution of potash, or other chemicals, thereby forming a slip or plastic substance out of which the articles to be manufactured are formed by being pressed into matrices of the required form by hydraulic or other powerful machinery to give it the required adhesion and form, after which the articles are baked or burned in the usual way. *Patent abandoned.*

128. J. C. Dickey. *An improved quartz crusher.* Dated Jan. 17, 1862.

This quartz crusher is composed of a drum having an axis projecting from each of its ends, the drum being divided at right angles to the axes into two parts, the two parts being held together by bolts and nuts. The axes of the drum are hollow, and on one of them is keyed a pulley, by which the drum may be caused to rotate; the end of one of the hollow axes is in connection with the end of a pipe coming from a hopper, in which the quartz to be crushed is placed, so that the drum is fed from this hopper with the quartz to be crushed. In the other hollow axis is fitted a conical sieve, through which the quartz as it is crushed escapes and passes away through the end of the hollow axis. Around the interior of the periphery of the drum is a ring or lining which is caused to rotate with the drum by projections on the ring entering recesses in the drum. Within the drum are three or other number of blocks or hammers of an oval section; the hammers turn eccentrically upon pins carried by the sides of the drum, and, as the drum revolves, the hammers fall over against the ring or lining, and crush the material in the drum; the action of the hammers also causes the pulverised material to escape through the sieve. *Patent abandoned.*

129. R. Romaine. *Improvements in apparatus to be used in cultivating land by steam power, and in steam boilers used for agricultural and traction purposes.* Dated Jan. 17, 1862.

This invention refers to a previous patent of the year 1859, No. 1,229, and consists in certain arrangements of parts by which the traction rope may be made to control the slack rope, the apparatus being rendered applicable to winding gear, in which the two ends of a rope are alternately wound up by two winding drums, one drum winding whilst the other allows the rope to run off. The invention also relates to an arrangement of winding apparatus, in which are employed three V-shaped grooved sheaves, geared together and placed alongside the steam-engine on vertical axes. Also, the invention consists in constructing a dead anchor to resist the draught of the implements employed in steam cultivation. Also, in improvements in the fire-box of the common horizontal tubular boiler employed for agricultural or traction purposes. *Patent completed.*

130. J. Tow. *Improvements in the construction of stoves or fire-places.* Dated Jan. 18, 1862.

The object here is the construction of stoves or fire-places for heating apartments or buildings, whereby the draught can be easily regulated and the escape of smoke into the room or apartment prevented. There is also an arrangement by which hot air may be conducted from such stoves to any part of a building. Stoves or fire-places constructed according to this invention are formed in several parts, so that they may be readily taken to pieces for examination or repair, and for facility in fixing. *Patent completed.*

131. T. Emmott and J. Travis. *Improvements in the manufacture of velvet, velveteens, and other similar piled fabrics.* Dated Jan. 18, 1862.

This relates to the manufacture of piled fabrics, the pile of which is produced by the weft threads floating over the warp threads, and the principal feature consists in the application of coarse binding weft threads to form the back of the fabric, and finer weft threads for the face; also in the application of coarse warp threads to form the back of the fabric, and finer ones to form the face. *Patent completed.*

132. T. NEWTON. *Improvements in sights for rifles.* Dated Jan. 18, 1862.

This relates, 1, to the fore-sight, and consists in making it portable and adjustable, instead of having it permanently fixed to the barrel of the piece. 2, to the back-sight, and consists in improved modes of filling up the space between the sliding or elevating bar and the bottom of the holder. *Patent completed.*

133. E. DAVIES. *Improvements in apparatus for gauging and cutting soap.* Dated Jan. 18, 1862.

Here the inventor employs two plates of metal or wood, forming two sides of a box, placed at the required distance apart and used as a gauge. Between the said sides of the box a wire or knife is placed horizontally, so that, when the said box is moved along the surface of the soap, it gauges and cuts at the same time. *Patent abandoned.*

134. W. HELME. *A newly-invented fire-lighter.* Dated Jan 18, 1862.

This fire-lighter the inventor constructs from the waste blocks of wood out of which bobbins, spools, &c., are cut. The cylinders for forming the bobbins, spools, &c., are cut so that the remaining portion of the block shall be connected together, thus forming a skeleton. This he either dips into molten resin or other inflammable matter, or fills the holes with resin, pitch, or other material. *Patent abandoned.*

135. J. J. STEVENS. *Improvements in point indicators for railways.* Dated Jan. 18, 1862.

This invention was described and illustrated at page 51 of our last number. *Patent completed.*

136. W. TICE. *Improvements in gas regulators and other apparatus in which movable spindles are employed.* Dated Jan. 18, 1862.

This consists, 1, in soaking such flexible diaphragms, of whatever material they may be composed, in glycerine, or other like substance, and afterwards coating them with a mixture of treacle or glue, or other saccharine and animal matter reduced to a proper consistency, for preserving the flexibility and filling up the pores of such flexible diaphragms; 2, in all gas regulators and such like instruments in which various descriptions of metal spindles are used, travelling in or through some description of metal, the inventor either makes such spindles with glass, porcelain, or other like material, and he also inserts in the cover, or in such part of the instrument in which the spindle should work, a tube of glass, porcelain, &c.; and he also makes the valves of, or covers them with, glass, porcelain, or other like materials; or he coats the valves and valve seals with an alloy of silver or other non-corrosive substance. *Patent abandoned.*

137. S. DREYFOUS. *An improved throstle spinning frame.* (A communication.) Dated Jan. 18, 1862.

This invention is not described apart from the drawings. *Patent completed.*

138. W. S. WINANS. *Improvements in the manner of mounting and apparatus for manœuvring cannon or ordnance on ships or vessels of war and floating batteries.* Dated Jan. 18, 1862.

The patentee claims, 1, mounting cannon or ordnance, and their carriages and platforms, on board ships, &c., so that they may be raised and lowered at pleasure by steam or other motive power for the purposes set forth; 2, making hatchways or openings in the upper decks of ships, &c., through which the cannon or ordnance may be raised from and lowered to an under deck for the purposes set forth; 3, adapting to such hatchways or openings covers which are to be worked or moved by the agency of steam or other power. *Patent completed.*

139. T. ROBERTS and J. DALE. *Improvements in the manufacture of gunpowder.* Dated Jan. 18, 1862.

This consists in a method of making gunpowder, whereby the patentees are enabled to use nitrate of soda instead of or in combination with nitrate of potash. This they effect by adding thereto a substance which will effloresce, so as to correct the tendency of the other material or materials to become moist. Of these substances they name, for example, the anhydrous sulphate of soda and magnesia. *Patent completed.*

140. W. S. MAPPIN. *A new or improved lock.* Dated Jan. 20, 1862.

This invention is not described apart from the drawings. *Patent completed.*

141. A. BARBAT. *Some improvements in the manufacture of hats, bonnets, and other like articles.* Dated Jan. 20, 1862.

This relates chiefly to the manufacture of fancy hats, and consists in the employment of a fabric having its warp and weft of horse-hair &c. only, or having either its warp or weft of silk, cotton, &c., combined with fabrics composed of other materials. *Patent completed.*

142. T. HOLT. *Improvements in folding iron chairs and chair bedsteads.* Dated Jan. 20, 1862.

This has reference chiefly to the mode of sustaining the chair-back, and is carried out as follows:— Near the forward upper angle of the parallelogram or other figure described by the bars forming the arms, the inventor joints a diagonal piece, and on the horizontal part of the arms he cuts notches to receive a pin or other catch of the diagonal piece; this diagonal piece fixes the arms in position, and thereby sustains the chair-back. Any person can readily alter the position or incline of the back at pleasure, by simply moving the diagonal catches from one set of notches to another. *Patent abandoned.*

143. T. W. JOBLING. *Improvements in the adaptation of locomotive engines to traction or haulage in mines.* Dated Jan. 20, 1862.

The patentee claims, 1, feeding or supplying the furnaces and boilers of locomotive engines with fuel and water previously heated; 2, condensing the exhaust steam and products of combustion by causing them to pass into and through a tank of cold water before discharging them into the atmosphere. *Patent completed.*

144. W. BOALER. *Certain improvements in the method of sizing paper yarns and woven fabrics, and in machinery or apparatus connected therewith.* (A communication.) Dated Jan. 20, 1862.

This consists in the use of steam in combination with pure starch or other sizing material directly upon the paper, yarn, or cloth in the sizing vessel or receptacle, or upon the surface of the sizing roller or its equivalent, as described. *Patent completed.*

145. A. LAMB. *Improvements in life-boats.* Dated Jan. 20, 1862.

The patentees construct life-boats according to this invention with longitudinal water-tight compartments or air chambers formed on each side of the boat, and extending from stem to stern, or between the bow and stern compartments, and carried up to the gunwale; these are combined with bow and stern water-tight compartments extending from side to side of the boat. These bow and stern compartments should be only of such a height from the bottom as to leave a space below the top side of the gunwale, the space thus left being made available for seats, when not designed to be otherwise employed. Or, in certain cases, these compartments may at the sides extend above the line of gunwale, leaving a flat space or recess sufficiently below the line of gunwale to enable the weight of persons seated in such recess to be kept as low as possible. For carrying a gun forward, the compartment at the bows is extended in length sufficiently far aft to provide a suitable bearing for the gun-carriage, and to enable the gun to work clear of the mast. *Patent completed.*

146. J. BIRD. *An improved crank axle applicable to cranks of any description whatsoever, wherein the wear is mainly on one side thereof.* Dated Jan. 20, 1862.

This consists in forging the axles between each pair of collars, where collars are used, and where collars are not used at each extremity of the axle, of an oval form on the side where the wear will mainly be, and of a semicircular form on the other half thereof; each collar has a recess forged or otherwise formed in it to receive the snugs which are cast on the ends, and which form part of a piece of iron or other metal, which is shaped in such wise that, when one of such castings is laid on the axles formed as above described, the said casting will form the axle round, the casting being secured to the axle by a screw passed through the snugs and into the axle outside the collars, where they are used, whereby when the casting is worn nearly through, by the pressure of the bearing upon it, it can be readily replaced by another casting. The same method may be applied to axles which are fixed having the bearings revolving, or having the bearings fixed or movable. *Patent completed.*

147. E. C. NICHOLSON. *Improvements in the preparation of colours suitable for dyeing and printing.* Dated Jan. 20, 1862.

Here the patentee takes red dye, such as is made from aniline or its homologue, and without the admixture of either aniline or its homologue, heats it carefully to a temperature, by preference, between 390° and 420° Fahr. The substance quickly assumes the appearance of a dark semi-solid mass, the red dye being transformed into a dark substance with evolution of ammonia. The mass he prefers afterwards to extract with acetic acid, using a quantity of acid about equal in weight to the amount of red dye treated, and this acid he dilutes with enough alcohol to make a dye of convenient commercial strength. The solution obtained is of a deep violet or purple colour, and may be used directly for dyeing purposes. *Patent completed.*

148. J. W. AGNEW. *An adjusting last.* (A communication.) Dated Jan. 20, 1862.

This is carried into effect as follows:—To the usual or any form of last are affixed toe plates, or thin sheets of malleable iron, steel, brass, or other hard metal, of about one-eighth of an inch in thickness, and of about 3 inches in length, which toe plates are fastened to the last by a screw, working through a slot in the same, of about an inch in length, into a metal nut inserted in the toe of the last, which screw and nut hold the toe plate securely to the last. In order to lengthen the last, the screw is loosened, and the toe-plate pushed forward to the size required, when the screw is made fast again, and so on. *Patent abandoned.*

149. R. O. DOREMUS and B. L. BUDD. *Making cartridges.* Dated Jan. 20, 1862.

The patentees claim, first, forming the ordinary granulated gunpowder of commerce into shapes suitable for use as cartridges, by compacting the same within moulds by pressure, so applied as to condense the said powder into those shapes, substantially as described. Second, giving to the cartridge the principle of acceleration by forming it in strata of different rates of combustibility, substantially as described. Third, combining the ball or other projectile directly with the powder, to form a fixed charge, substantially as described. *Patent completed.*

150. J. STENHOUSE. *Improvements in the protection of metallic surfaces, and in rendering certain substances less pervious to air and moisture.* Dated Jan. 21, 1862.

This relates to the use of the substance called paraffin, either in a solid state or dissolved in any of the usual solvents, such as highly-rectified coal tar or petroleum, naphtha, or bisulphuret of carbon, for protecting metallic substances, and rendering certain substances less pervious to air and moisture. The metallic surfaces which the patentee proposes protecting are, gold and silver leaf, brass, tin, and tin-foil, copper, bronze powder, mosaic and Dutch gold, and the various kinds of gilding and gilded articles. The substances which he proposes rendering less pervious to air and moisture are, felt, flocks, woollen yarn, cotton yarn, flax yarn, manufactured skins and furs, artificial flowers and leaves. The method of applying the paraffin to metallic surfaces consists in coating them therewith; the mode of applying paraffin to the substances before named consists in coating or impregnating them therewith. *Patent completed.*

151. J. A. KNIGHT. *Improvements in the permanent way of railways.* (A communication.) Dated Jan. 21, 1862.

The object of this invention is to connect the cross ties, sleepers, or pedestals and chairs and rails in such a way that they will constitute a complete and well-secured system, without the intervention of any bolts or keys or other fastenings, and it consists in fitting the cross ties and pedestals together with a socket or lock joint, and in combining them with chairs that conform to the section of the rails and hold them securely without the usual taper keys or wedges. To prevent the injury incident to concussion upon a perfectly rigid support, the patentee interposes india rubber or other elastic material between the parts, so that it is easy of access and permits of the adjustment of the track without disturbing the pedestals or the ballasting of the roadway. *Patent completed.*

152. J. F. TOURRIER. *The diffusion of heat in houses by means of hot air without extra fire.* Dated Jan. 21, 1862.

Here a grate such as is generally used is provided with an air chamber or tank of iron, screwed at the back or sides of the grate, which chamber or chambers will from their position derive great heat from the fire, the heated air contained in the above chambers being communicated by pipes. *Patent abandoned.*

PROVISIONAL PROTECTIONS.

Dated May 3, 1862.

1307. H. Juhel, Bordeaux, France, ironmaster. An improvement in wheels. (A communication.)

1316. G. Neall, Islington, Middlesex. Improved apparatus for obtaining and applying motive power, especially applicable to propelling carriages on common roads.

Dated May 8, 1862.

1377. A. Bearne, 24 Union Street, Torquay, Devon, boot maker. Improvements in the construction of boots, shoes, and goloshes, rendering them elastic to pressure.

Dated May 19, 1862.

1517. A. V. Newton, 66 Chancery Lane, Middlesex, mechanical draughtsman. Improved machinery for splitting leather. (A communication.)

Dated June 14, 1862.

1767. J. Lancelott, Clifton Terrace, Birmingham, jeweller. Improvements in the manufacture of ornamental chains from sheet metal.

Dated June 21, 1862.

1836. A. F. Maigron, 46 Rue Grande Marengo, Marseilles, France, mechanician. Improvements in machinery or apparatus for the manufacture of tow or oakum, and for winding off, carding, and spinning all kinds of fibrous fabrics.

Dated June 24, 1862.

1855. J. Johnston, Paisley, Renfrew, North Britain, hat manufacturer. Improvements in hats.

Dated June 25, 1862.

1868. J. Whitham, Perseverance Ironworks, Leeds, engineer. Improvements in the apparatus used in working oil and other hydraulic presses.

Dated June 26, 1862.

1873. E. T. Hughes, patent agent, 123 Chancery Lane. Improvements in regulating or moderating the movement of the keys of piano-fortes. (A communication.)

Dated June 28, 1862.

1897. G. H. Hulskamp, Troy, New York, pianoforte maker. Improvements in pianofortes.

Dated June 30, 1862.

1910. W. F. Murray, Glasgow, Lanarkshire, N.B., potter. Improvements in the manufacture of stoneware bottles, and in apparatus connected therewith.

1912. W. Easton, Oakinellgate, Gateshead-on-Tyne, and G. Donkin, Bill Quay, Gateshead-on-Tyne, Durham. Improvements in lears or annealing chambers and apparatus used in annealing glass.

Dated July 3, 1862.

1937. T. Turner, gun manufacturer, Fisher Street, Birmingham, and W. Taylor, engineer, Aston New Town. Certain improvements in single and double breech-loading fire-arms.

1939. W. A. Gilbee, South Street, Finsbury, London. An improved manufacture of blue colouring matter. (A communication.)

Dated July 7, 1862.

1956. C. Wessely, 22 Canterbury Place, Lambeth Road, Surrey. Improvements in carriages.

Dated July 8, 1862.

1961. J. H. Johnson, 47 Lincoln's Inn Fields, Middlesex, 166 Buchanan Street, Glasgow, North Britain, gentleman. Improvements in wet gas meters. (A communication.)

1963. J. Brown, Middleton, Lancashire, machinist. An improved motion for actuating the doffers of carding engines for carding cotton and other fibrous substances.

1965. C. Slatford, manufacturer. Improvements in trimmings, tufts, and other articles for ornamental and decorative purposes.

1966. J. Rigby, Suffolk Street, Dublin, Ireland, gun maker. Improvements in breech-loading guns, and in extracting cartridges from such guns, and also in wind sights for fire arms.

1969. H. Wethered, Bristol, colliery proprietor. Improvements in the construction of handles, latches, or fastenings for doors, gates, and windows.

Dated July 9, 1862.

1970. W. L. Wiggington, 4 Clifton Cottages, Hammersmith, Middlesex. An improved method of, and apparatus for, curing smoky chimneys.

1973. A. Gilbey, Oxford Street, London, wine merchant. Improvements in apparatus for washing and cleansing bottles.

1975. J. Rhodes, Morley, Leeds, machine maker. Improvements in rag machines. (A communication.)

1977. H. Eschwege, 14 Mincing Lane, London. Improvements in purifying wood and other vinegar.

1978. G. T. Bousfield, Loughborough Park, Brixton, Surrey. Improvements in washing machines. (A communication.)

1979. E. S. Hindley, Bourton, Dorsetshire. Improvements in apparatus used when circulating hot water for warming dwelling-houses and other places, which apparatus may be used for cooling and condensing.

1981. S. V. Evers, 80 Lower Thames Street, London. Improvements in the preparation of beverages. (Partly a communication.)

Dated July 10, 1862.

1983. W. F. Reynolds, Commercial Road, Middlesex. An improved watch pendant.

1985. H. Kellogg, New Haven, Connecticut, America. Improvements in breech-loading fire arms and cartridges therefor.

1986. J. Mander, Birmingham, manufacturer. Improvements in crochet needles and crochet needle holders.

1987. A. Bonnell, Hethpool Street, Maida Hill, Middlesex. Improvements in churns. (A communication.)

1989. E. J. Biddle, New York, engineer. The use of petroleum or coal oil as fuel, and also for the machinery and apparatus to be employed for this purpose.

1991. J. Leeming, North Holme Mills, Bradford, Yorkshire. Improvements in jacquard or index machines.

1992. D. Steele, Bunhill Row, Finsbury, Middlesex. Improvements in the method of flushing or distributing the water in pans or basins applicable to waterclosets, urinals, wash-hand basins or other purposes.

1993. T. Farra, Manchester, salesman. Improvements in wearing apparel, called skirts or petticoats and frocks.

1994. J. H. Johnson, 47 Lincoln's Inn Fields, Middlesex, gentleman. Improvements in braiding machines. (A communication.)

Dated July 11, 1862.

1995. J. R. Hill, engineer, 7 Duke Street, Adelphi, London. An improved governor for the engines of steam vessels.

1996. M. Cornall, Manchester, Lancashire, doubler, and E. Griffiths, yarn agent. Improvements in doubling, twisting, and reeling threads and yarns of cotton and other fibrous materials.

1997. J. Waithman, Manchester, flax spinner. Improvements in machinery or apparatus for carding flax, tow, or other fibrous materials.

1999. J. Orr, Glasgow, manager. Improvements in weaving piled fabrics, and in the machinery or apparatus connected therewith.

2000. J. Miller, Lambeth, Surrey, gentleman. Improvements in apparatus for steering ships and other vessels.

2001. W. Bliss, Chipping Norton, Oxfordshire, woollen manufacturer. Improvements in heating ores, and in generating steam, and also in the apparatus employed therein. (A communication.)

Dated July 12, 1862.

2002. C. E. Green, 13 Blanford Street, Portman Square, Middlesex, and J. Green, Windermere Cottage, Winchmore Hill, Edmonton. Improvements in breech-loading fire-arms.

2003. J. P. Lees and J. Beard, Ashton-under-Lyne, Lancashire, machine makers. Certain improvements in carding engines.

2005. J. Hunt, Queen's Mill, Preston, Lancashire. Improvements in the process of sizing and drying yarns or threads, and in the apparatus employed in such process.

2007. T. Hill, Hampton House, Great Warley, Essex, brewer. Improvements in the arrangements employed for the protection of markers at rifle-butts, and in the means employed in indicating the score and position of the shot and wiping out the shot mark.

2008. E. T. Hughes, Chancery Lane, London. An improved system of winding or rolling silk thread on moulds or bobbins and placing them in suitable boxes. (A communication.)

2009. J. H. Johnson, 47 Lincoln's Inn Fields, Middlesex, gentleman. Improvements in machinery or apparatus for washing ores and minerals. (A communication.)

2010. W. E. Gedge, 11 Wellington Street, Strand, Middlesex, patent agent. Improvements in the manufacture of hats. (A communication.)

2011. P. Plassan, Tours, France, doctor. An improved orthopœdic apparatus for straightening the human frame.

2013. H. Barber, spring knife cutler, 60 Thomas Street, and H. de Garrs, brass and wood turner, 34 Pomond Street, Ecclesall Bierlow, Sheffield. Improvements in rolling iron, steel, and other metals for cutlery tools and other purposes.

2014. The Hon. W. E. Cochrane, Osnaburgh Terrace, Regent's Park, Middlesex. Improvements in railway fastenings.

Dated July 14, 1862.

2015. E. Taylor, 167 Regent Street, London. Improvements in the manufacture of buttons.

2016. G. Lowry, Salford, Lancashire, machinist. Improvements in machinery for carding and cleaning cotton and other fibrous materials.

2017. W. E. Gedge, 11 Wellington Street, Strand, Middlesex. An improved portable or stationary steam lift and force pump. (A communication.)

2019. C. Crossley and J. W. Crossley, Halifax, Yorkshire. Improvements in means or apparatus employed in washing and finishing textile fabrics.

2020. S. Partridge, Darlaston, Staffordshire, surgeon. Improvements in railway signals.

2021. P. Sanderson and R. Sanderson, Galashiels, Selkirk, North Britain, manufacturers. Improvements in the manufacture of woven fabrics, and in the machinery or apparatus employed therein.

2022. W. G. May, Glasgow, cabinet maker. Improvements in apparatus for extending tables.

2023. P. A. L. Canonicat, 50 Rue des Petits Pères, Marseilles, France, civil engineer. Improvements in filtering water, and in apparatus employed therein.

2024. G. Faweus, North Shields, Northumberland, shipbuilder. Improvements in building boats.

2025. F. M. Parkes, Plumstead, Kent, gentleman. Improvements in the manufacture of gas for lighting and heating, and in apparatus employed in the said manufacture.

2027. R. Ridley, Morlui, near Leeds, Yorkshire, and J. G. Jones, 4 Cambridge Villas, Battersea, Surrey. Improvements in machinery and apparatus for ventilating mines and other places.

Dated July 15, 1862.

2028. A. Leslie, Turriff, Aberdeenshire, North Britain, farmer. Improvements in apparatus for applying steam or other motive power to cultivate the soil and to actuate wheeled carriages.

2030. J. Green, Newtown, St. Martin, Worcestershire, agriculturist. Improvements in the method and means of producing signals, and in the application of the same, particularly to steam ploughs and cultivators.

2033. W. Dickens, Salford, Lancashire, machine maker, and J. Hewitt, Manchester, machinist. Improvements in self-acting and hand mules employed in spinning cotton and other fibrous materials.

2034. C. E. Crawley, 17 Gracechurch Street, London, and F. Foster, 7 Ashley Crescent, City Road, Middlesex. Improvements in safety or miners' lamps.

Dated July 16, 1862.

2036. B. Johnson, Chester, engineer, and E. H. Taylor, Coed Talon, Mold, Flint, engineer. Improvements in rope wheels, cages, and tanks used for mines, collieries, and other similar purposes.

2037. G. T. Selby, Smethwick, Staffordshire, tube manufacturer. Improvements in apparatus for superheating in tubes and tubular articles and in machinery for the manufacture thereof.

2038. L. R. Bodmer, 2 Thavies Inn, Holborn, London. Improvements in apparatus for winding up watches and other time keepers. (A communication.)

2039. W. Henson, Nottingham, engineer, and W. W. Clay, Sneinton, Nottinghamshire, machinist. Improvements in knitting machinery, and in apparatus connected therewith.

2040. A. V. Newton, 66 Chancery Lane, Middlesex, mechanical draughtsman. An improvement in sewing machines. (A communication.)

2041. C. Sanderson, Sheffield, Yorkshire, steel manufacturer. Improvements in the manufacture of crinoline or crinoline steel.

Dated July 17, 1862.

2046. J. G. Harkness, Birkenhead, Cheshire, storekeeper. An improved safety handle for winches, cranes, and other like machines.

2048. T. B. Daft, 2 Queen Square, Westminster. Improvements in the manufacture of mats and other surfaces, where vulcanised india rubber is employed.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2052. O. F. Morrill, Massachusetts, America. A certain new and useful apparatus for generating heat for culinary or various other purposes. *Dated July* 18, 1862.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

693. G. Calvert. Castors.

703. G. H. Birkbeck. Trusses or bandages. (A communication.)

726. J. T. and T. Pendlebury. Lubricator.

749. J. Banks. Electro-magnetic telegraph printing apparatus.

760. R. A. Brooman. Barytes and barytic products. (A communication.)

763. R. Hadfield and J. Shipman. Hardening and tempering wire and crinoline steel.

767. R. A. Brooman. Printing and painting upon glass and ceramic wares, and upon metallic and mineral substances. (A communication.)

768. R. A. Brooman. Producing copies of guipure, lace, embroidery, and other like articles. (A communication.)

770. R. A. Brooman. Drawing in and paying out chain cables. (A communication.)

777. E. Smith. Apparatus for cutting stone, wood, and other material.

778. E. Field. Apparatus for regulating the flow of gaseous and other fluids.

780. W. Clark. Manufacture of soap. (A communication.)

785. J. Newall. Supplying gas to railway carriages, stations, steamboats, and other vessels.

788. J. Humphrys. Steam engines.

789. B. H. Mathew. Fire-arms and cartridges.

790. W. Phelps and W. R. Lymbery. Improved woven fabric, and improvements in machinery for manufacturing the same.

795. T. Fontenay. Smoke-consuming furnaces.

797. E. Lord. Preparing cotton and other fibrous substances.

798. J. Davis. Wind musical instruments.

801. J. H. Tuck. Flexible valves.

802. J. G. Jennings. Biscuits.

817. J. Stewart. Cards for jacquard weaving. (A communication.)

824. T. Guibal. Ventilation of mines and furnaces.

834. W. J. Taylor. Colouring Portland cement.

842. A. V. Newton. Separating the fibres of wood, flax, hemp, and other vegetable substances, and extracting the colouring matter therefrom. (A communication.)

847. F. Tolhausen. Cigar-tubes or apparatus for holding and smoking cigars. (A communication.)

876. C. H. Townsend, J. Young, and J Hankins. Removing and preventing incrustation in steam boilers.

889. R. Young. Cleaning, separating, washing, and drying grain.

916. H. W. Whitehead and G. Bray. Carding wool and other fibrous substances.

919. H. J. Madge. Coating iron sheets or plates.

956. T Silver. Governors.

1049. W. Clark. Leathern accoutrements. (A communication.)

1108. W. E. Newton. Manufacture of cannon and other ordnance. (A communication.)

1127. C. D. Abel. Certain alloys containing cadmium. (A communication.)

1162. C. Callebaut. Sewing machines.

1192. W. Haggett. Engines and carriages for railways.

1196. J. Winsborrow. Wet gas meters.

1245. G. R. Samson. Valves or cylinders for wind musical instruments.

1251. W. E. Newton. Picking, burring, and cleaning wool. (A communication.)

1419. J. B. Pope. Lowering and loading coals, minerals, or other substances.

1465. J. P. Jouvin. Preserving iron-plated and other vessels and metallic articles from oxidation.

1786. A. Crestadoro. Obtaining and applying motive power from rarefied air.

1844. H. Ponsonby. Top-sail sheet bits or bolts.

1884. E. Hunt and H. D. Pochin. Condensing apparatus.

1891. A. A. Croll. Treatment of ammoniacal liquor of gas works.

1900. C. Callebaut. Sewing machines.

1912. W. Easton and G. Donkin. Lears or annealing chambers.

1926. J. James. Welding railway crossings.

1934. J. Webster. Gas for illumination.

2001. W. Bliss. Heating ores and generating steam. (A communication.)

2040. A. V. Newton. Sewing machines. (A communication.)

2052. O. F. Morrill. Generating heat.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed July 25, 1862.

209. W. Orr.
229. J. H. Brierley.
236. J B. Harby.
243. G. Phillips, sen. and G. Phillips, jun.
278. T. Cook.
282. L. Hill.
290. G. Manwaring.
297. J. Webster.
300. W. E. Taylor.
308. J. B. Payne.
400. J. H. Johnson.
425. J. Combe.
470. W. Ashton.
498. W. E. Newton.
856. W. E. Gedge.
1185. J. H. Johnson.
1258. A. V. Newton.
1350. J. H. Johnson.
1352. J. H. Johnson.
1592. W. Palmer.

Sealed July 29, 1862.

249. W. Davies.
257. H. Schatten.
262. P. Scheurweghs and A. J. A. H. De Boisserolle.
264. E. H. C. Monckton.
269. W. Smith.
280. F. Riesbeck and W. Becker.
284. C. W. Lancaster.
288. W. Clark.
293. J. L. Norton.
299. D. Gallafent.
311. A. C. Bamlett.
320. J. Tonkin.
328. W. Clark.
330. W. H. Bartholomew.
339. M. A. F. Mennons.
356. W. Wood.
378. M. A. F. Mennons.
484. M. A. F. Mennons.
606. T. Hack.
994. J. Whitehouse.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1761. P. A. Viette.
1744. J. Scoffern.
1747. E. Hunt and H. D. Pochin.
1765. J. Wood.
97. C. A. Girard.

PATENTS ON WHICH THE SEVENTH YEAR'S STAMP DUTY HAS BEEN PAID.

1691. W. Weallens.
1695. C. Schiele.
1800. V. Delperdange.
1850. A. V. Newton.
1732. J. Hanson.

LIST OF SPECIFICATIONS PUBLISHED,

During the Week ending July 26, 1862.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s. d.		s. d.		s. d		s. d.		s. d.		s. d.
3155	1 6	3166	0 7	3177	1 4	3188	0 10	3199	0 3	3210	0 3
3156	0 3	3167	0 6	3178	0 9	3189	0 3	3200	0 9	3211	2 2
3157	1 10	3168	0 8	3179	0 10	3190	0 10	3201	0 10	3212	0 4
3158	0 [illegible]	3169	0 [illegible]	3180	0 7	3191	0 10	3202	2 6	...	...
3159	1 6	3170	0 [illegible]	3181	0 7	3192	0 3	3203	0 4	...	...
3160	0 [illegible]	3171	0 [illegible]	3182	0 10	3193	0 10	3204	0 4	...	..
3161	0 4	3172	0 3	3183	0 10	3194	0 8	3205	0 8	...	...
3162	0 6	3173	0 10	3184	0 8	3195	0 3	3206	0 6	...	...
3163	0 [illegible]	3174	0 3	3185	0 4	3196	1 6	3207	0 10	...	...
3164	0 6	3175	0 3	3186	0 3	3197	0 6	3208	0 7	...	...
3165	0 [illegible]	3176	0 3	3187	0 [illegible]	3198	0 3	3209	0 10	...	..

Note.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, AUGUST 8, 1862.

EXHIBITION, 1862.

Marine Engineering.

In resuming our observations on the Marine Engine display in the International Exhibition, and the mode in which the duties of the jurors have been performed, it will be necessary continually to bear in mind the instructions issued by the Royal Commissioners for the guidance of the jurors in the distribution of their awards, or we shall run the chance of doing the latter some injustice, which we should much regret, remembering that their duties could under no circumstances be otherwise than onerous. With respect to the construction of the juries we have a word to say.

In our view, no one should have been engaged on any of the juries who was either an exhibitor in his respective class, or even in any way engaged or interested in the trade of those whose products he was called upon to examine and adjudicate upon. It might have been urged that very great difficulty would have been found in obtaining a sufficient number of jurors wholly disengaged from trade and yet competent to discuss purely practical questions. We admit the difficulty, but feel quite assured it could have been overcome, especially as in most cases the number of the jurors was unnecessarily large. The Royal Commissioners would also, doubtless, throw much of the blame of deciding upon unfit judges on the exhibitors themselves, inasmuch as the former state that the names selected were mostly those proposed by the latter. But let us ask whether any one person exhibiting marine engines, for instance, desired to have the merits of his productions determined by manufacturers of rival plans. The idea is monstrous. Class 8, in which the marine engines appear, included also many other things; and it is quite possible that a *majority* of exhibitors in this class (General Machinery) might propose the names of persons as jurors who were well known for their skill as mechanical men, but not rivals in their own special trades. We venture, however, to say, without fear of contradiction, that no exhibitor proposed the name of a rival manufacturer in his own special department. The result of the Commissioners' mode of selection, therefore, although at first sight apparently perfectly fair, practically was most unfair; for by it A's productions were judged by jurors selected by B, C, and D, such jurors being unobjectionable as judges of the latter's manufactures, but a rival manufacturer of A, and not therefore competent as a judge of his work.

It was not enough, in order to reconcile exhibitors to the Royal Commissioners' selection, to exclude jurors who were exhibitors from those entitled to receive prizes; this was, of course, necessary, but wholly insufficient to satisfy exhibitors that justice was done. Indeed, as it has turned out, this withholding of prizes from jurors was a matter of very little moment, for the number of medals given has been so large that the fact of the jurors who are exhibitors receiving prizes would hardly have been looked upon with even suspicion, most of the jurors who are exhibitors being at the head of their respective trades, and thus, in all probability, as deserving of a prize as many others.

To begin with the medals awarded to the exhibitors of marine engines in the United Kingdom section, and in taking them alphabetically, we note the name of Humphreys & Tennant, of Deptford. In this case a medal is well and properly bestowed, but not altogether on the grounds assigned by the jurors. The engines are good, undoubtedly, as regards "simplicity," "accessibility of all parts," and "good workmanship," but they are not "compact;" for the space occupied by engines of this class, with ordinary but short connecting rods, is, if the condensers be placed so as to balance the cylinders — i. e., nearly the same distance from the shaft — anything but compact. The jurors might as well, indeed more reasonably, have assigned "originality of general design" as one of the reasons of their award. The link motion is good and original, and we think the best in use; but in other respects there is nothing special in the engines. The jurors pass over entirely the model of the Mooltan's engines, perhaps because it was not catalogued, but possibly because these engines were the first of the kind made. These engines are not only novel in their arrangement, that is as vertical screw engines (for the use of two cylinders, one behind the other, was suggested and patented in 1855) but present the most recent example of what may be done in improving marine engines as regards saving of fuel. Thus, notwithstanding Mr. Humphreys's claim to this arrangement of cylinders for screw engines is contested, yet, as the matter stands, the model was well worthy of separate notice, much credit being due to the manufacturer for the trouble he has been at in carrying out the plan practically, although the notion of double cylinders for screw engines, placed end to end, was, as we have said, patented seven years ago.

Of the award to Messrs. Laird of a medal, we have nothing to say, except that it is well "simplicity" was not one of the grounds of commendation. The medal is, however, fairly given.

Messrs. Maudslay obtain a prize for "general excellence" of their engines, "also of the collection of working models." Now, this is too bad. We don't mean to say that Messrs. Maudslay are not deserving of a medal for their engines, which, of course, are good working machines, although the valves being at the top of the cylinders makes them somewhat complicated, and less desirable, in our view, than other forms; but we object to a good collection of models, merely as a collection of models, getting a medal. The jurors have evidently here been delighted with seeing well-made models in motion and ship-shape order; but there is nothing in all this for which to give a medal. If any notice had been taken of the models at all, it should have been for the one showing Mr. Sell's arrangement of three cylinders, the same as fitted to the Government screw vessel Octavio, and the medal should have been awarded to the designer, as has been done in other cases. We do not altogether like the three-cylinder arrangement, but there is enough in the practical working out of the details to warrant special notice being taken of it. To award a medal for "general excellence" in a number of models, is simply nonsense. Why should not Ravenhill & Salkend have a medal on the same grounds? their models are just as well made as Maudslay's, but then they were *not at work*. Ravenhill's were the first to bring out the double piston-rod arrangement for screw engines; and of their engines on this plan may be predicated, not only "general excellence," but "compactness," "simplicity," "practical "success," and a good many other things which should fully have entitled them to a medal, and would have obtained one if their models had been accompanied by a full-grown engine of say 600 or 800 horse-power. The jurors "honourably mention" the models of oscillating engines exhibited by this firm. We assume they mean both the inclined and ordinary vertical cylinders, for no distinction is made. The ordinary oscillating engines of Messrs. Ravenhill are amongst the very finest that have ever been made, and might well have merited some special notice. Would not they have obtained it, if they had been exhibited on a scale of a pair of 400 horse-power engines?

To the award of a medal to Messrs. Morrison we have nothing to say. The engines are "compact" and "simple;" and although we cannot believe vertical cylinders for driving screws will be long in use, there they are when wanted, with the various parts well put together and arranged.

Messrs. Napier, of Glasgow, obtain a medal for the engines of the Persia, which are well known to have worked satisfactorily, but we can scarcely reconcile ourselves to this firm deserving a medal for their engines, unless it be for the determination they have shown, in face of all opposition, to adhere to the old type of engine, with its multitude of parts, in preference to those of more modern construction. With a handful of medals, however, undistributed, the jurors could not well help sticking one behind Messrs. Napier's drawings, especially as these are not "opposition" engines, Messrs. Napier having them all to themselves.

The engines of Messrs. Rennie have deservedly obtained a medal for "originality," the arrangement of two trunk cylinders and two trunk air-pumps, being compact and working satisfactorily. It is a great pity, however, that the double cylinder horizontal engine this firm constructed, on Mr. E. E. Allen's patent, expressly for the Exhibition, could not be completed in time. The arrangement will be found very badly illustrated in Part IV. of the Official Illustrated Catalogue, in which it is described as capable of exerting an indicated horse-power (when fitted with surface condensers, superheaters, and feed-water heaters) by the consumption of about 2 lbs. of coal. These engines—a pair of 8's—may be seen, we believe, at Messrs. Rennie's factory by those interested, and photographs already are, or shortly will be, exhibited on their engines in the Exhibition. It would be satisfactory to know what the jury would have done with reference to these new engines, had they been exhibited; the advantageous working of the principle, viz., that of double expansion, being fully proved in the case of the Mooltan's engines, of which, however, as we have said, the jury took no notice.

Of the award made to Tod & M'Gregor's engines, we would observe the same as in respect to Messrs. Morrison's. For an inverted single expansive cylinder engine, the arrangement is good and easily repaired.

Randolph & Elder exhibit drawings of their double expansive screw engines, as arranged for the Government screw Constance; and logs of their double expansive paddle engines of which several pairs have been for some time working satisfactorily on *half the ordinary consumption of fuel*. From the drawings representing engines actually made, and the logs of engines actually worked for some years, we should have felt certain that the jurors would

have awarded this firm a medal; but they do not get even honourable mention. How is this? Supposing their names are not in the catalogue, this is no reason, as the drawings and logs are in the building, and were so, we feel assured, before June 15. Perhaps these gentlemen do not care for a medal; but if they do, they may at least console themselves with the public judgment that they ought to have had one. Although there are some arrangements in their screw engines which we do not like, their paddle engines have never been beaten, and can hardly be beaten; at any rate they are, taking economy of fuel into account, the best engines at present made.

Mr. E. E. Allen's models occupy a somewhat retired position near the entrance, but against the wall. This exhibitor was late in getting his models in; and this, together with the omission of them from the catalogue, prevented the jury from examining them until after the awards were made, at which several of them have expressed their regret.

One of the models represents a horizontal screw engine, with small and large cylinders end to end, and corresponds with the engines built by Messrs. Rennie, before referred to, and of which we understand two pairs are being made by Messrs. Day & Co., of Southampton, as well as a pair of 500-horse power by Humphreys & Tennant for the Poonah. These last engines, however, have a trunk for attaching the connecting rods to— an arrangement also shown in Allen's patent of 1855; and the second model has a new arrangement for screw or paddle engines, patented the early part of this year in the name of E. E. Allen & John Stewart. In this case the cylinder is divided into two parts, and has a double-pistoned trunk working in it. The steam from the boiler acts round the trunk and thence expands on the whole area of the pistons at each end of the cylinder. As we shall probably illustrate this patent when specified, we shall not attempt further to describe it here, but would merely add that the model representing this and the other double-cylinder arrangement for driving screw propellers might fairly, for their novelty, and it may almost be said success of one of the forms, have received a medal from the hands of the jurors. Of the few other honourable mentions and of the foreign exhibitors, we shall speak in a concluding article next week.

SEWING MACHINES IN THE INTERNATIONAL EXHIBITION.

No. II.

In estimating the value of a sewing machine, the great point is, to get a mechanical contrivance to do the work of a needlewoman or tailor quicker than the fingers of a needlewoman or tailor can do it; as neatly and as strong; and to adapt the machine to all the manipulations of the sempstress and tailor, or even the cordwainer. The public generally is not conversant with the technical names given to stitches and seams. Perhaps it has heard of hemming and herring-boning, of gussets and button-holes. It has a complete work brought before it, in the masculine or feminine department of the household, and it approves or disapproves *ad captandum*; but the public knows no more in general of the technicalities of a garment than Jacob Omnium knows of the architectural technicalities of his suburban villa, or the veterinarian terms applied to his cob.

Now, it has been the aim of inventors and improvers in the sewing machine to do all that human fingers can accomplish with the common needle and thread. They intend that the machine should embroider, work plain-stitch, hem a handkerchief, do the gatherings of a skirt, ornament the uppers of my lady's slippers, or do the sterner duty of securing the soles and other parts of my lord's boots and shoes. They intend that it should accomplish all in needlework, from the maid's rough work in the kitchen, to the young lady's more ambitious efforts in the drawing-room. That these ends have been accomplished to a great extent, may be seen by anyone who has an interest in the matter, through paying a visit to the very clever operators on these handy little machines in the International Exhibition.

The Howe sewing machine is entitled to priority of mention among those exhibited in the American Court. His is the basis of all successful machines. Since the date of his patent in 1846, various improvements have added considerably to its utility, without at all affecting its principle. That principle was the stitch formed of two threads by means of an eye-pointed needle, carrying a thread for one side of the goods, and a shuttle carrying also a thread for the other; the needle passes the thread in a loop through the cloth, while the shuttle passes its thread through the loop, when, by the combined action of the feed-motion, and a fresh passing of the shuttle through the loop, the stitches are drawn tight and interlocked within the body of the fabric, forming a tight seam, the stitch of which cannot be unravelled. The feed-motion, which is a combined patent of Howe, Wheeler & Wilson, Singer, and Grover & Baker, is a very ingenious contrivance for propelling the work by means of a serrated plate, by which the material can be turned at will to any desired curvature without interfering with the progressive motion of the fabric through the machine. This was suggested by a basterplate which Howe had invented, but which the four-motion feed has now superseded. It will thus be seen that the essential characteristics of Howe's invention may be thus enumerated :—

1st. A mechanism for making stitches, or interlocking of thread, combined with an apparatus for making tension on the thread, and drawing up and securing each stitch when formed.

2nd. An apparatus consisting of two surfaces, between which the material to be sewed is contained, and which support it against the thrust and retraction of the needle, and in such a position as to permit the stitches to be drawn tight.

3rd. An automatic, intermittently-acting, feeding apparatus, which causes the material to pass with a regular movement between the holding surfaces in the intervals between the punctures of the needle with an unerring precision and uniformity of effect, impossible to obtain by hand.

These three essential properties were never in use in any sewing machine prior to Howe's, and no machine has been subsequently made without them, in a more or less modified degree.

But Howe has improved marvellously and effectively, even upon these, by the invention of a cylinder machine. This is as great an advance upon his original invention as that was upon hand sewing; it is the introduction of an entirely new principle in sewing by machinery. All shuttle sewing machines make their stitch by the needle entering the material and remaining there until the shuttle passes and takes up the loop. By the cylinder machine, the needle pierces the material to be sewn, carrying its loop with it in its downward course, and leaves it within the material, then returns, when the shuttle starts forward, takes the loop and tightens the upper thread; the needle-arm is then lifted considerably, and the shuttle-thread by that means tightened. It will be seen that the stitch is thus made when the needle is *out* of the material, and, as a consequence, very close sewing, closer even than by hand, can be made. The cylinder machine carries the finest and coarsest needle, and will sew from one thickness of kid to the stoutest harness leather, with ease and facility; it also admits of anything being sewn upon it which cannot be laid flat upon the sewing plate of an ordinary machine—such as a narrow sleeve or the leg of a boot. The award of a prize medal to Howe's sewing machine will, we think, be acquiesced in by all its competitors.

Wheeler & Wilson's machine is very remarkable on account of the novelty of its construction. Here we have still the double stitch; but the "lock" is accomplished by means of a rotating hook instead of a shuttle. The underfeeding bobbin differs also from those used in other machines. This bobbin is about the diameter and thickness of a florin; but between the two surfaces there is a deep groove, containing the requisite supply of thread. The bobbin is placed within the rotating hook, and winds off according to the demands of the machine. The rotating hook itself, larger in diameter than the bobbin, is the segment of a circle—a complete circle almost, but interrupted in its periphery by a kind of gash. The effective segment of the gash has a pointed end, which catches into the loop made by the needle, drags it round about three-quarters of its circuit, when the thread is released and pulled tight through touching a rest. The hooked wheel revolves again to catch a loop, and again to make a close stitch. But in these successive revolutions it not only catches itself into the down-loop from the needle, but inserts the thread from the bobbin it carries. There is a small apparatus on the surface of the machine for spooling the thread. The tension is so regulated that the upper and under threads are used together equally, so that there are no loose stitches, and the seam cannot be drawn into puckers.

The annexed diagrams will tend, perhaps, to make the mode in which this machine

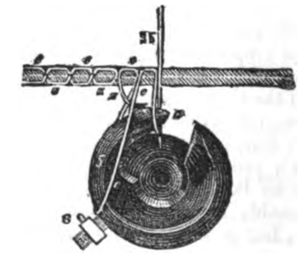


Fig. 1.

operates plain to the reader. The stitch is formed by the combined action of an eye-pointed needle, 35 (fig. 1), carrying the upper thread, *e*, a rotating hook, 5, and a double convex metallic spool carrying the lower thread. It will be observed that the needle having descended, as it rises the line of thread upon its right is slightly looped. The point, *a*, of the rotating hook, 5, reaches the needle at this instant, passes close to its right side, and enters the loop of thread. As it further revolves, it enlarges this loop and carries it forward. As the loop slips from the point of the hook, and is drawn up, it will be found to

enclose the lower thread, and interlock with it. The loop would slip from the hook when it had made little more than one-half of a revolution, and as it is drawn up by the hook in enlarging the next loop, it is necessary to hold it until the hook shall have completed the revolution and entered the next loop. For this office, the loop-check, 36, is employed. It consists of a small brush, or an equivalent, held in slight contact with the periphery of the hook as it rotates, and thus holds the loop as in fig. 1, and prevents its slipping until the hook has completed its revolution, and enters the next loop at the needle as seen in fig. 2.

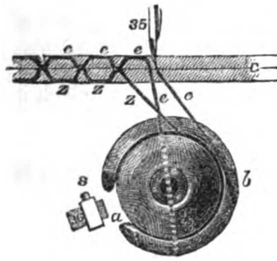


Fig. 2.

The chamfered portion of the hook then reaches this check and relieves the loop, which is then drawn up, as seen in the same figure; when this is so worn as not to check the loop, it should be adjusted. The Wheeler & Wilson machine is a pretty-looking, pleasant-working piece of mechanism, and at the present moment stands high in point of popularity.

The sewing machine of Wilcox & Gibbs is a single thread chain stitch, against which some people have a prejudice, from its liability to ravel, or "run out." It is certainly possible, by undoing the finishing loop, to draw the whole out, but ordinary wear will not do this: and its beauty of stitch and great rapidity of operation render it useful for many kinds of domestic work. That it has held its own against the competition of shuttle-stitch and lock-stitch, is a proof of some goodness in it, which is not to be despised. There is a curious history connected with this particular invention, as curious as that relating to the history of fluxions. In the latter case it has been matter of doubt whether Sir Isaac Newton or Huygens was the discoverer. It is said that the letter of the great English philosopher, announcing to the great Dutch philosopher his mathematical discovery, crossed the letter of the Dutchman to the Englishman, communicating a similar result of intellectual grasp and effort. So it was with James Gibbs. He had never heard of a sewing machine. He had never heard of Duncan's, invented fifty years before. He was a homely, plodding farmer in the mountains of Virginia, who took it into his head that he could dispense with "sewing days"—an American "institution" not always to the liking of the master of the house, who does not care for an invasion of needles and thimbles upon appointed occasions to put the family wardrobe to rights. A "sewing-day," we take it, must be as terrible an infliction to the American husband as a "washing day" is to the English one. James Gibbs, without knowing what Morey and Howe had attempted, or were about, employed his active brains in inventing a sewing machine, and succeeded. The character of the stitch, and the method of forming it, bear some resemblance to those in the machines of Chas. Morey, but the apparatus is superior in construction and well adapted for a variety of domestic purposes. The great peculiarity in the mechanism is a "spur looper," which catches the slack down-loop, retains it, and by its peculiar conformation holds the next down-loop distended so as to be caught again at the next revolution of the spur. By this arrangement, there is no chance of a stitch being dropped, and the seam is as even and tight as can be desired. "The shape of the needle and manner of adjusting it are secured by patent to James Wilcox, and the machine has the exclusive use of a convenient, self-acting, and noiseless stop, by which a reverse motion of the wheels is prevented, and also of a guard to protect the dress of the operator from the rubbing of the balance wheel. The apparatus for catching and looping the thread as it is passed through by the needle consists of two arms making together a cross at the end of a horizontal axis. As this revolves close to the needle under the cloth plate, one of these arms, shaped like a hook, and rapidly enlarging toward its base, catches the thread and spreads the loop, which is then brought against the axis, and next slips upon the other arm, which gives the loop a twist and holds it. At the same time the needle goes up and comes down again through the cloth, carrying its thread through the loop already formed, when it is caught by the hook, and the first loop being released is drawn tight by the pulling of the hook in spreading the second. *The twist given to the thread in forming the loop has a material effect in strengthening the hold of the thread in the cloth, and thus producing a very strong and durable seam.* Its strength and little liability to rip may be readily seen by cutting a narrow strip across the seam of a piece of cotton thus sewed, and comparing it with a similar piece sewed by hand. On attempting to pull or rip the pieces apart, *it will be found that the former thus tested is the stronger of the two.* The tendency to ravel, hitherto the objectionable feature of machines of this class, is in this obviated by the drawing of the end of the thread through the preceding loop by the hook at the last stitch, and thus fastening it whenever it is broken by design or accident. If, however, this loop should be loosened and the end of the thread withdrawn, and then pulled, the whole seam may be ravelled like knitting work; but this can only occur when an end is first loosened in this manner, and no such result is likely to take place in ordinary wear. The needle, being short and straight, runs with perfect exactness and certainty across seams, and even over several abruptly increasing thicknesses of cloth."

These machines have become the family instruments for sewing in a great many households in England as well as in America, and their great simplicity and ease of operation are strong commendations in their favour.

The machine of Mr. J. M. Singer has little in it to be described beyond the ordinary shuttle machine. It is manufactured under licence from Howe, whose machine it most resembles. There are some peculiarities about it as regards the spring tension between the spool and the needle, and the check-regulating wire. This machine has been largely used in manufactories—such as those for slops, and soldiers' clothes. It has given employment to many hands in this direction. The firm has manufactured, from first to last, about 60,000 machines, 8,000 of which have been sold in England. Their manufactory in New York gives employment to 800 persons.

We have in a former number noticed Mr. Bigelow's boot-sewing machine, and, were it not a "sewing machine" in principle, there would be no need to mention it again. Sew, however, it does, and that the thickest leather with as much facility as the other machines sew cloth or muslin. We do not know whether the shoemaker and tailor crafts be in danger by these machines; but looking at them from our own point of view, we are led to believe that their general use will be to exempt a large number of the present or coming generation from the sedentary occupations of the stool and the shop-board.

The American Court is, undoubtedly, the great centre of interest for sewing machines, and there may be some truth in the remark of a lady visitor to the Exhibition—herself, however, an American—that if America had sent nothing else to the grand show of the industry and ingenuity of nations than sewing machines, these in themselves would have been a noble contribution. It is only those who have looked into the frame-work and mechanism of these, who are able to appreciate the ingenuity which was requisite to produce them, and, seeing them in operation, can value their utility.

FORTIFICATIONS AND GUNS.

Three pamphlets have just issued from the press, which, in their bearings and tendency, have so near a relationship to each other that we do not hesitate to discuss their merits in the same article. The first of these is entitled, "Sir Morton Peto, and the Defence Commission;" the second, "The Armstrong Gun compared with Rifled Cast-iron Service Guns (unstrengthened), on Mr. Bashley Britten's System;" and the third, "A Few Words on the Construction of Ordnance, by an Outsider." It is not necessary for us to reiterate here our own opinions upon the general questions of the best means of protecting our shores and of the kind of artillery which should be employed afloat and ashore for the purposes of defence; those opinions are too well known to require recapitulation. We have, however, a love of fair play, and a desire that the public—who have to bear the expense of all the experiments and schemes, enquiries and commissions, made or instituted by the Government in respect to fortifications and guns—should hear all sides of the question.

In the first-named pamphlet, an attempt is made by its anonymous author to prove that Sir Morton Peto, in his recent written and spoken onslaughts upon the Defence Commission, was actuated by unworthy motives, and guilty of unfair conduct towards the members of that commission. His principal crime consists, according to this authority, in the publication of certain "Observations on the Report of the Defence Commissioners, with an Analysis of the Evidence," and wherein are evinced palpable misrepresentations, and convenient suppressions of the truth. These are, undoubtedly, heavy and serious charges to make against a public man, and especially one whose moral qualifications are rated so highly as those of Sir Morton Peto. It must be admitted, nevertheless, that a considerable amount of colour is given to these charges by the knight-errant who represents the Commissioners. It is too often the case that rival pamphleteers, in the desire to upset each other's arguments, indulge in personalities which only weaken their own, and betray infirmities of temper, rather than evolve sound axioms. To some extent, this is true, both of Sir M. Peto and of the "Unknown" who has now entered the lists against him. The writer of "Sir Morton Peto and the Defence Commission" traces the history and the doings of the commission from the period of its issue,

under the advice of Lord Herbert, in the month of August, 1859, to its latest achievement in the shape of a report presented to Parliament very recently. He also furnishes brief biographical notices of the ten members who now comprise it, and, from their antecedents, draws inferences of their fitness for the posts they hold. Extracts are also given of the reports of the Commission in the years 1860 and 1861, with a view to support their consistency, which was "battered" at in the "Observations" of Sir Morton.

With this preliminary matter, though interesting enough in itself, it is not our present purpose to deal. It will be more profitable to our readers, we trust, to come to the gravamen of the charges laid at the door of the hon. member for Finsbury, and to see by what evidence they are sought to be justified. The plaintiff, or counsel, rather, quotes from the "Observations" of Sir Morton the following paragraph :—"In all the opinions they have "expressed as to the relative cost of forts and "ships, the report of the Commissioners is as "completely at variance with the evidence of "their witnesses, as upon the other points of "their investigation." To this the reply is, that "the fact is not so; but, even if it had "been so, that circumstance in itself would "not necessarily have been any impeachment "of the judgment or conduct of the Commis- "sioners." The conclusions of a commission, further observes Sir Morton, "can only be of "value so far as they may reflect the evidence "of the witnesses before them. In the present "instance, the Defence Commissioners obtained "the evidence of several officers of the naval "and military services, whose professional "knowledge and position entitle their opinions "to great consideration. The evidence of "these officers will show Parliament and the "public, the little authority which the Com- "missioners have for their conclusions, and "the absolute manner in which they have "ignored the evidence." These are strong words, undoubtedly, but the justification of the Commissioners is to be found, so thinks their defender, in the fact that "each of the "gentlemen comprising the Commission was, "at least, as competent to give a judgment on "the questions submitted to them as any of "the witnesses who appeared before them. " * * * The Commissioners were not "bound to call any witnesses before them at "all, on matters of which they themselves "were quite competent to judge; and if they "did call them, they were not bound to sur- "render their own judgment to the opinions "of those whom they consulted." These and other arguments are adduced in support of the independent action of a Royal Commission, and its right to frame its report in accordance with the sentiments of its own members. We cannot but coincide with Sir Morton's opponent on the point at issue: and, thinking thus, must admit that much of the indignation of the member for Finsbury has been idly expended.

The reasons which induce Sir Morton Peto to abstain from giving evidence before the Commission, when invited to do so, are obscure, and, to a certain extent, unsatisfactory; but we can hardly suppose that the theory of his refusal is to be found, as suggested, in the consideration that "it is much easier to write "an address to a constituency on a subject "that they do not understand, than to support "propositions in the presence of persons who "are sufficiently well acquainted with the "subject to test the value of an opinion." Passing forward to Sir Morton's "Analysis of "the Evidence," and taking for granted the allegations made against it, it is difficult to come to any other conclusion than that its writer was most anxious to sustain his attack upon the Commissioners, and not too scrupulous about the means. We cannot, of course, reproduce all the statements made in the pamphlet before us tending to justify this opinion, but, as an example, we adduce one in reference to the evidence given before the Commission by Captain Hewlett. Sir Morton Peto states in his "Analysis," that this witness "appeared to "be as little in favour of the forts as the other "witnesses." In order to make good this assertion, he then quotes Captain Hewlett's replies to questions 247 and 249, but omits that to question 248, which question and its answer run thus:—"If a certain form of iron- "plated ships were appropriated for the de- "fence of Spithead and Portsmouth, do you "consider that the Spithead forts would aid "the ships to a certain extent?"—"I think "there is no doubt that they would be a valu- "able assistance to ships taking refuge there; "if our force were superior to the attacking "force, they would be valuable in affording "refuge, and enabling you to make sorties "from under the forts to attack the enemy." To use the mildest form of expression, there does appear an abundance of ingeniousness on the part of the hon. member in omitting to mention this admission of Captain Hewlett. We have no love for the Spithead forts, but must plead guilty to a weakness in favour of having out "the truth, the whole truth, and "nothing but the truth."

Without, however, expending further comment upon this well-written pamphlet, we must say that the public will look for a rejoinder to it from Sir Morton, or they will be apt to think that, in his desire to demolish the fortifications off Portsmouth, he has allowed his assumption of the advocacy of floating defences to cloud his sense of moral rectitude.

The second pamphlet referred to above, is one which demands a larger share of attention than we can at present devote to it. It is calmly written, dispassionately argumentative, and thoroughly practical. Its title, indeed, very truthfully illustrates its character; and facts and tabular formulæ, based on experiments, go to demonstrate the soundness of the author's views. It will be a simple act of justice on the part of those who still adhere to the notion that Armstrong guns are the *ne plus ultra* of our artillery armament, to obtain and read Mr. Britten's little pamphlet, which is published by Mitchell, 39 Charing Cross, and which is replete with sound information. It may be that we shall next week analyse it, and give examples of some of its averments.

The "Few Words on the Construction of "Ordnance," by Mr. Charles Gubbins—whose name was honourably mentioned during the Indian mutiny—are well worth listening to; and, although the author is modest enough to call himself "An Outsider," he has exhibited strong claims to notice from those who are "insiders" in the knowledge of gunnery. Mr. Gubbins lays claim to much of the honour which has been accorded to Sir William Armstrong, and states that the processes of manufacture formerly adopted, at the suggestion of that very fortunate gentleman, "have been found insufficient to "bear the charges of powder at present ex- "perimented with, and that he is falling back "on methods identical with those suggested "by Mr. Gubbins in 1854, and which were "then placed at the disposition of the Govern- "ment." Under pressure of unquestionable testimony, such as that of the author of "A "Few Words," and the still heavier pressure of repeated failures of the Armstrong gun, it will require something more than the offhand and unsustained assertions of Sir Cornewall Lewis to bolster up the weapon about which so much controversy has been waged, and, alas! upon which so much money has been expended.

We cordially recommend to the scientific public the third pamphlet of the series; and we feel assured that out of that chaos which the authorities of the nation have managed to create, order will presently emerge. The works we have now referred to are suggestive and valuable, and, although the first-named may appear to be of a somewhat personal character, yet they all tend to the dispersion of official mists, and to the consequent placing the question of Fortifications and Guns in a clearer light than that in which it is now seen.

THE METROPOLITAN MAIN DRAINAGE WORKS.

(From *The Times*.)

The great main drainage scheme of London is a work of such magnitude as no city in the world but this would require, and certainly a work of such cost as very few cities in the world but this could afford to pay for. There is something almost grand in the idea of a single city consenting to pay nearly 4,000,000*l.* sterling for subterranean drains, which never have been and never can be seen, and of which our descendants will almost doubt the necessity, from the radical nature of the cure they will bring about in the health of the metropolis. That the change it will effect on the cleanliness of the city, and, therefore, on the health of the inhabitants, will be most important, our readers will readily believe; but, in order that they may fully understand what is the improvement, it will be necessary to say a few words about the old system which the new is to supersede. It used to be an old saying, that London was the best drained city in the world. There are plenty of drains, no doubt—in fact, the subterranean web of drains and sewers which burrows beneath London is said to be more than 2,000 miles in length. There is, however, a dark side to this picture, and that dark side, as our readers can easily guess, is the Thames. It is in vain that we speak of our drainage, and point to the hundreds of miles of sewers and drains which have been added to London within the last ten or fifteen years. Every new drain, in fact, only increased the evils of a system which at last became unendurable, and which, but for the means which have been taken to abolish it, must have made a plague-spot of the whole metropolis. The only matter for astonishment is that our costly and incessant efforts to poison the air and water have not been thus punished long before this. It is the knowledge that in the ordinary course of events a visitation of this kind could not be much longer averted, that has led to the great main drainage scheme being undertaken.

It is of the general features of this great plan that we now propose to give our readers an outline. The subject is, we own, a dirty one, and scarcely adapted for the literature of the dog-days; but after inhaling dirt and drinking dirt for so many many years, we may well afford to read about it and to look statistically into that foulest of all our great sewers, the river Thames. Until the adoption of the present scheme, the object of all London drainage was to make the Thames the great main sewer of the metropolis, an object which we shall see was realised to the fullest possible extent. All the sewers in London on both sides of the river run due north and south, discharging themselves into the Thames within a length of some five or six miles. At the very first glance this arrangement seems bad enough, though it is infinitely worse when we come to examine how it was arranged to work. On both sides of the river the banks are very little above high-water mark, while the average level of the ground immediately behind them is much below it; half

Lambeth, Bermondsey, and Rotherhithe being 6 ft. below high-water level. Of course, when this is the level of the ground, the sewers are much lower still, and their outlets so completely tide-locked that it is only at dead low water that they can empty themselves at all. Thus, for nearly eighteen hours out of the twenty-four the sewage on both sides of London used to be, and is still to an immense extent, pent up, giving off its miasma into every street and house. As we have said, it could only escape at dead low water, when the returning tide immediately churned it *up* the river, keeping all its abominable "flotsam and jetsam" above bridge till the tide ebbed out, finding 200,000 or 300,000 gallons of filth to be operated upon in a similar manner on its return. This was the arrangement twelve years ago, and is almost entirely so still; but, even bad as this was, it was capable of being made worse; and worse accordingly it was made. In 1849 most of the houses in London had cesspools attached to them, and a very large proportion were without any drains at all. The alarming nature of this evil showed itself slowly but surely in the Bills of Mortality, and the then Commissioners of Sewers, who were feebly battling with the evils of the drainage system, set to work to mitigate the cesspool danger by drainage, making the Thames, as usual, the general receptacle. From that time to the present some 700 or 800 miles of new drains have been made, and all cesspools made to drain at once into the river. By this "improved" drainage some 200,000 additional gallons of sewage were daily added to the Thames at low water, containing no less than 300 tons of "organic matter," which in this case is the scientific term for filth. Nor was the Thames the only sufferer. Wherever a stream could be found, no matter how clear its waters, or how beneficial its course, drains were at once made into it. Hackney Brook, once well known to anglers as one of the clearest and prettiest of streams that wound from the north of London into the river Lea, was made to vie with the Thames in filth and stench; and even the Serpentine was brought into requisition, and the Ranelagh sewer (one of the largest in London) daily discharged itself into that much-prized piece of ornamental water. The Thames, however, as the largest claimant, always got the preference of dirt, and the great mass of corruption which has flowed into it year after year has at last made it the largest and dirtiest open sewer in Europe. The result, as a matter of course, has been that in the summer months the stench from the river has occasionally been intolerable. In 1857 great quantities of lime and chloride of lime were put in daily; in 1858 the same expedient had to be resorted to again; and in 1859 the dose had to be increased to 110 tons of lime and 12 tons of chloride of lime, costing some 1,500*l.* per week. Even in a pecuniary point of view, however, this was not the only evil of the system. The Thames in this hot weather runs short of water, and when there is no rain the collections of refuse in the sewers have to be flushed into the river by artificial means. This flushing alone during summer costs 20,000*l.* a-year to get the poison into the Thames, where 20,000*l.* more is generally required to keep it from breeding a plague. The tide in summer carries off little or nothing. A marked object was set afloat in the river and watched, with a view of ascertaining this fact, and for three weeks it went backwards and forwards between Vauxhall and London Bridges, without going much farther either way. During the same period, of course, the sewage of the Thames, increased by its daily contribution, goes backwards and forwards likewise under the summer sun, and yet people profess to wonder why it smells so dreadfully. The magnitude and importance of this evil have long been known, and Mr. Bazalgette, the chief engineer to the Board of Works, fought long and assiduously to have the plan improved, and, strongly aided by public opinion, his fight has been successful. His main drainage scheme is nearly completed. In less than two years more it will be entirely completed, the Thames purified, and London effectually drained.

As may easily be imagined, it is impossible in an article like the present to give more than an outline of this great plan, which may best be briefly described as consisting of three gigantic main tunnels or sewers on each side of the river. These completely divide underground London, from west to east, and cutting all existing sewers at right angles intercept their flow to the Thames, and carry every gallon of London sewage under certain conditions into the river on the north side below Barking, and on the south to near Erith. These main drains are called the High, Middle, and Low Level sewers, according to the height of the localities which each respectively drains. The High Level on the north side is about eight miles in length, and runs from Hampstead to Bow, being at its rise only 4 ft. 6 in. in diameter, and thence increasing in circumference, as the waters of the sewers it intercepts require a wider course, to 5 ft., 6 ft., 7 ft., 10 ft. 6 in., 11 ft. 6 in., and at its termination, near Lea river, to 12 ft. 6 in. in diameter. This drain is entirely finished and in full work. Its *minimum* fall is 2 ft. in the mile, its *maximum* at the beginning nearly 50 ft. a mile. It is laid at a depth of from 20 to 26 ft. below the ground, and drains an area of fourteen square miles. The Middle Level, as being lower in the valley on the slope of which London is built, is laid at a greater depth, varying from 30 to 36 feet, and even more below the surface. This is nearly complete, and extends from Kensal Green to Bow. The Low Level will extend from Cremorne to Abbey Mills, on the marshes near Stratford; but as the city portion of this will pass through the Thames Embankment, we shall have occasion to refer to it hereafter. At Bow the Low Level waters will be raised by powerful engines at a pumping station to the junction of the High and Middle Level ducts, thence descending by their own gravity through three tunnels to the main reservoir and final outfall below Barking. These three tunnels are each 9 ft. 6 in. in diameter and nearly four miles long. Great engineering difficulties existed in the construction of these main arteries, as from the height at which they all meet, it was necessary to take them above the level of the marshes leading to Barking. For a mile and a half the embankment which encloses the three tunnels is carried on brick arches, the piers going 18 ft. below the surface, and being based on solid concrete. Apparently this ground had not been disturbed for very many centuries. In the course of the excavations Roman and early British pottery was found, with skulls of an almost totally different type from the skulls of the present day, with quaint weapons, flint spear and arrow heads, rough knives, and horse accoutrements in iron. In the marshes at Barking the reservoir for the reception of the sewage of the north side is formed. This reservoir is a mile and a half long by 100 ft. wide, and 21 ft. deep. It is made of this great length in proportion to width to allow of its being roofed with brick arches, which are again covered with earth to a considerable thickness, so that not the slightest smell or escape of miasma can take place. This reservoir is capable of containing more than three times the amount of sewage which can enter it while the pipes which communicate from the bottom of the reservoir to the bed of the river remain closed. In fact, the whole scheme of the main drainage has been carried out on the principle of making all the works large enough to meet the demands of future generations for almost the next two centuries to come. Thus, when all is complete, the works will not only be large enough to take off all London's sewage now, but its sewage when London is double its present size.

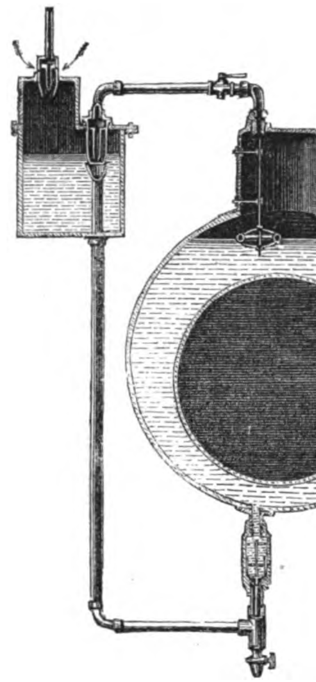
While the sewage is in the reservoir we have spoken of, it will be completely deodorised by an admixture of lime. When the tide is at its height the sluices which pass from the bottom of the reservoir far out into the bed of the river will be opened, and the whole allowed to flow away. It takes two hours to thus empty the reservoir, by which time the tide will be flowing down strongly, and will carry its very last gallon a distance of 13 miles below Barking, which, being itself 13 miles below London, will place the contents of the sewers, every 12 hours, 26 or more miles distant from the metropolis. Thus, instead of letting loose the rankest of this great city's abominations in the very midst of London, and leaving it to stagnate, or, still worse, to be agitated backwards and forwords in a small body of water, it will all be carried away a distance of 13 miles, then deodorised, then suffered to escape into a body of water more than a hundred times greater than that into which it now crawls, and thus, disinfected and diluted so as to be without either taste or smell, swept still farther down the stream, till every trace of it is lost. Many competent persons, however, are of opinion that the sewage of London possesses considerable value as liquid manure, and ought not to be thus wasted; but without at all discussing this question, on which there are many discordant opinions, we may say that arrangements are about being entered into between the Board of Works and a company which proposes to bring the question to a practical solution, and to apply the sewage as manure, for a certain time and under certain conditions. This attempt to utilise the sewage will be made on a large scale, and according to the best plans, so that, one way or other, the question as to its value will be set at rest for ever.

On the south side of the Thames the three great sewer arteries are constructed on similar plans. The High Level commences at Dulwich, and runs to Deptford Creek; the Middle Level begins at Clapham, and ends at the same terminus; and the Low Level will be from Putney to Deptford. At this point is to be a pumping station (now nearly finished), which, like that on the north side, will raise the water from the south Low Level to the channel of the High Level, whence both streams will flow of their own gravitation through a tunnel 10 feet 6 inches in diameter to Crossness Point, in the Erith Marshes. One part of this tunnel, passing under Woolwich, is a mile and a half long, without a single break, and carried at a depth of 80 feet from the surface. At the outfall will be another pumping station, to lift the water to the reservoir. The southern reservoir is only 5 acres in extent; that on the north is 14. In the reservoir it will be deodorised, and discharged in a similar way to that we have already described. The pumping stations will each consist of an engine-house, containing ten boilers, calculated to work up to 500-horse power nominal. This power working through eight pumps of 7 feet diameter and 4 feet stroke, will daily raise 19,000,000 cubic feet of sewage from 19 feet below low water to the level of the outfall, but, in case of necessity, the pumps can raise 25,000,000 cubic feet per day. Any of the main sewers can be disconnected if necessary from the others by means of sluice gates, and the chimneys of the pumping stations themselves are used to draw off and consume the foul air in the sewers. The total length of the three rows of intercepting sewers, the course of which we have sketched on each side of the river, will be 50 miles, and before all the works are completed, 800,000 cubic yards of concrete will be consumed, upwards of 300,000,000 of bricks, and 4,000,000 cubic yards of earthwork.

There are many other points of special interest connected with this gigantic scheme, but into which we have no space to enter now. We must reserve to another occasion these further details, especially those of great interest connected with the Thames Embankment.

The *Mining Gazette* (Houghton, Lake Superior) states that Wm. Bull has made an important improvement in stamping machinery at the Copper Falls Mill. The improvement consists in expediting the flow of stamped sand from the mortar, as soon as it is sufficiently pulverised for washing, thereby increasing the working capacity of the stampers to about one-third more than at present. This is accomplished by a different and peculiar construction of the mortar, increasing its area, without increasing its bulk, and permitting the rock to be fed in on two sides, instead of one, as in those now in use, insuring a more regular supply. It is stated that one set of such stampers will crush as much rock in one day as two sets of the old stampers.

OLDING'S APPARATUS FOR FEEDING BOILERS.



A PATENT has just been obtained by Mr. H. J. Olding, engineer, of Smith Square, Westminster, for an invention of "Improvements in the mode of and apparatus for feeding steam boilers; also in apparatus for supplying fluids for other purposes, and in apparatus for raising fluids," as illustrated in the above engraving.

In feeding boilers the apparatus is arranged in such manner that the fluid is fed or supplied, intending to act on the law of equilibrium of fluids, that is to say, in seeking to find its level, the apparatus is self-acting or self-regulating, so that the decrease of water in the boiler opens the passage for the feed thereinto. The invention consists of a chamber or vessel, which communicates with the boiler by a pipe so formed as to proceed in a downward direction to a level lower than the boiler, and then come upward till it enters the boiler at a convenient part. The chamber also communicates with the steam chest or upper part of the boiler by an equilibrium pipe, and it also communicates with the tank or other source of supply of water. The passage through the feed and equilibrium pipes is controlled by valves arranged as shown. When the water in the boiler sinks below a certain determined level, the valve in the equilibrium pipe opens, and steam passes through it to the chamber, the water in which, in seeking to find its level, flows into the boiler through the feed pipe, and continues so to flow until the level is again attained in the boiler, whereupon the valves in the equilibrium and feed pipes close, and the feed is stopped. The equilibrium pipe valve consists of a plate or disc, which is capable of moving up and down or to and fro (suitably guided), and is attached to a ring, annular disc, or float, floating on the surface of the water in the boiler, so that when the water is low, the stem is depressed and moves the plate down or away with it, and opens the pipe, and when the water rises the stem and plate rise with it, so as to close the pipe. The valve in the feed pipe is also movable, being a plate attached to a stem (suitably guided) and capable of moving up and down, or to and from its seat. To this stem another plate of broader surface is attached, working against an angular bend or projection in or on a spring. When the smaller plate or valve proper is moved away from its seat so as to open, the water impinges against the broader plate, which, when carried thereby over the angle, performs the rest of its travel suddenly.

These valves, instead of being jointed on to their seats, move bodily away from or wholly off them; to open the pipes their line of motion to and from their seats is in a reciprocating-wise direction, or in a right line in the longitudinal direction of their stems.

Air is admitted into the chamber, so as to accompany the feed water, by a hollow conical valve or a conical pipe or chamber forming a valve raised and depressed with the raising and depressing of the water below it; air and water are admitted into the boiler, in such proportions as to supply sufficient oxygen and water, to prevent the generation of explosive hydrogen gas.

THE MANCHESTER ASSOCIATION FOR THE PREVENTION OF STEAM-BOILER EXPLOSIONS.

CHIEF ENGINEER'S MONTHLY REPORT.

AT the last ordinary Monthly Meeting of the Executive Committee of this Association, held at the Offices, 41 Corporation Street, Manchester, on Wednesday, July 30, 1862, William Fairbairn, Esq., C.E., F.R.S., in the chair, Mr. L. E. Fletcher, chief engineer, presented his Monthly Report, of which the following is an abstract: —

"During the last month there have been examined 323 engines and 563 boilers. Of the latter, 2 have been examined specially, 1 internally, 95 thoroughly, and 465 externally, in which the following defects have been found: — Fracture, 16 (2 dangerous); corrosion, 46 (8 dangerous); safety-valves out of order, 11 (1 dangerous); water gauges ditto, 19 (4 dangerous); pressure gauges ditto, 14; feed apparatus ditto, 11; blow-off cocks ditto, 28 (1 dangerous); fusible plugs ditto, 6; furnaces out of shape, 10 (3 dangerous); blistered plates, 7. Total, 168 (19 dangerous). Boilers without glass water gauges, 12; without pressure gauges, 2; without blow-off cocks, 50; without back pressure valves, 98.

"Three explosions occurring, during the past month, to boilers not under the inspection of this Association, have come to my knowledge. One of these took place in Manchester, the other in the neighbourhoood of Newcastle, and the third in London, while all three were attended with fatal consequences. The plates of the first are reported as having been found, on subsequent investigation, so reduced by corrosion, as not to have exceeded the thickness of a sheet of paper; while it is worthy of remark, with regard to the second, that its explosion had seriously damaged another boiler alongside of it, which, however, fortunately happened at the time to be out of work, or, from the injuries it received, it must have exploded in turn. This is frequently found to be the case, and the fact is of interest, as affording an indication of the variety of forces developed by explosion, which, as has been previously pointed out, evidently cannot be summed merely in that of disruption and the reaction consequent on unbalanced pressure.

"In addition to the above, however, it becomes my duty to report the occurrence of an explosion to one of the boilers belonging to a member of this Association, and which, it is to be regretted, was attended with loss of life to the fireman.

"This is the third fatal explosion which has happened to any of the boilers under the inspection of this Association since its establishment, nearly eight years ago, to which should be added three cases of collapse of furnace flues, not attended with any serious consequences, and which arose in two instances, if not in all three, from shortness of water. During this period, 656 dangerous defects have been pointed out in the boilers under inspection, from which serious injury might have arisen in each case; while, upon limited inquiry only, it has been found that no less than 202 fatal explosions have occurred in that time to boilers not under the inspection of this Association, which have been attended with the loss of 438 lives, in addition to serious injury to 476 persons, and considerable damage to property.

"The explosion last referred to occurred to one of a pair of ordinary cylindrical double-flued boilers, working side by side and connected together. Both boilers were set upon mid-feathers, and were of precisely similar construction and dimensions, the length of each being 34 feet, the diameter of the shells 7 feet, of the flues 2 feet 7½ inches, and the thickness of plates ⅜ths of an inch throughout, with the exception of the flat ends, which were $\frac{9}{16}$ths of an inch. The fittings consisted in each case of a glass water gauge; a back pressure and feed stop-valve combined; a blow-out valve, of mushroom construction, opening against the pressure in the boiler; and a lever safety valve, loaded with a single weight to a pressure of 35lbs. per square inch; in addition to a steam pressure gauge common to both boilers as long as both junction valves were open, but not otherwise.

"The explosion was occasioned by a rent in the shell, which took place directly through the line of rivets, at one of the longitudinal seams in the second ring of plates from the front of the boiler, the seam being on the right hand side, three feet from the centre or 'keel' line at the bottom. The construction of this seam was such that the edge of the outer plate was uppermost.

"The cause of the rent was thinning of the plates at this seam by external corrosion, through which it had become reduced to about $\frac{1}{16}$th of an inch in thickness. The corrosion extended throughout the length of the seam, which was about 2ft. 6in., and affected the plates on both sides of the lap to a width of from 4 to 6 inches. The rent did not extend longitudinally beyond the limit of this ring of plates, but ran along the transverse seams of rivets on each side of it, almost severing a complete belt from the boiler. The reaction from this opening raised the boiler momentarily almost on end, as was attested by the character of the fracture of the connections, the indentations in the bottom plates, and the fact that a pipe, previously overhead, had become buried beneath it, while the twin boiler alongside was blown bodily in a lateral direction. Had the longitudinal seams of rivets, instead of breaking joint, been in line, which is too frequently the case, the rent would certainly have run from one end of the boiler to the other, and the destruction of property, and very probably that of life also, have been more serious.

"This defect was one that could scarcely have escaped detection on a careful examination of the condition of the plates in the external flues. Still, it should be borne in mind that the plates of boilers set on mid-feathers are neither as accessible nor visible as they are in those set on two side walls with a split flue. The side flues in the latter case admit of coming face to face with the plates and seams in a manner which cannot be done in the former, in which many of them can only be seen obliquely at a very great disadvantage, while those at the upper part of the flue, in what may be termed the tip of the wing, are frequently out of reach altogether.

"All the members must be aware that, for the express purpose of detecting such defects as the above, the Association affords, in addition to the external inspections, the opportunity of having every boiler 'internally and thoroughly' examined at least once a year. The importance of these 'thorough' examinations has been repeatedly called attention to, and every opportunity taken to promote their being made, and, in order to suit the convenience of members as to time, the ordinary routine of visits is entirely set aside at holiday times, such as Whit-week, Christmas, Easter, and race weeks, so that the Inspectors may exclusively devote themselves to this special service.

"It is much to be regretted that the Association was not afforded an opportunity of making a 'thorough' examination of this boiler, either in the year 1860 or 1861, and, when in consequence of attention being specially called to this omission, our Inspector — at the request of the owners — visited the works last Easter, the boiler was found unprepared, the flues being imperfectly swept, and the plates coated with soot, although the visit had been expressly appointed, in order to effect a 'thorough' examination. Under these circum-

stances, no satisfactory examination could be made, which was distinctly stated to the engineer at the time, and subsequently officially reported in writing to the owners. So clearly was this understood, that the next time the boiler was stopped, the manager of the works went up the flues himself in order to complete the examination, which the want of preparation had previously prevented our Inspector from doing.

"It is hoped that our members will see from this the absolute necessity of having their boilers prepared for examination. They certainly cannot fail to remember how constantly this has been pressed upon their attention. A note, referring to it, appears at the foot of every notice forwarded to them, of the Inspector's proposed visit, and another, in the report on his examination, while reference was made to the subject in the Chief Engineer's Monthly Report for June, sent to each member, and, in addition, attention is frequently called by special letter, as it was in the present instance. Had it not been for its practical importance, so much had not been said upon so uninteresting a subject, and apology has sometimes been felt necessary for its frequent introduction. Still, dry or not dry, it is often a question of explosion or no explosion.

"Yet another word before dismissing this subject. To expect an Inspector to wait while the flues are being swept, as is too frequently the case, is really unreasonable, and compliance could only result in the accommodation of one member at the expense of another, while it would induce such disorder and breach of appointments, as would only lead to a general dead-lock, especially in such a thronged time as every holiday week is, when the Inspectors have one continuous string of engagements for these 'thorough' examinations, from its beginning to its close, many of them being fixed for more than a month previously.

"It may be added that the engineer who lost his life had been in the habit of going up the flues every month after they had been swept, and yet did not detect the corroded seam. This either shows that the corroded plate was concealed from view in some way in which it was impossible to account for after the explosion, or else is a witness to the necessity of competent inspection. That sweeps cannot be trusted to do engineering work is also clear.

"L. E. Fletcher, Chief Engineer.

FIRE ENGINES.

The following letter has appeared in the *Times* :—

Sir,—Excellent as are the present arrangements for extinguishing fires, and the machines already in use for that purpose, nevertheless, the unprecedented number and magnitude of the conflagrations which have lately visited the metropolis, have shown the necessity of providing the best possible means of suppressing or controlling this serious and increasing danger.

Recent experiments and experience have demonstrated the great advantage which the steam fire-engine possesses over that worked by manual labour, in the cheapness and facility of working, and in the much greater height and force with which a large and solid column of water can be thrown.

They have not hitherto been brought into general use from the supposed difficulty of getting up steam with sufficient rapidity, and from an apprehension that their weight and bulk would be too much for convenient portability.

These apprehensions are proved to be groundless, but it is felt that much is yet required to perfect the machine, and that it is very desirable to secure the attention of the best practical steam-engine makers to the improvements which may be effected.

For this purpose it is proposed to solicit the aid of fire insurance companies, municipal and parochial authorities, and others interested in the question, towards raising a fund sufficient to invite competition among eminent practical mechanics by the offer of handsome premiums for the best engines.

The chief points to which attention should be directed are: — *Efficiency*, combining facility of drawing water, volume thrown, and the distance to which it can be projected with the least amount of loss; *simplicity and durability of parts; the weight;* and *the cost*.

The undersigned have agreed to co-operate as a committee to carry out this project, and they come before the public earnestly requesting the assistance of all who are interested in the subject, and in the confident expectation that they will not be backward in contributing such an amount as will induce Americans and other foreigners to come forward and compete.

Further particulars will shortly appear in your advertising columns, and in the meantime the committee venture to solicit your advocacy of the cause.

Sutherland.	T. R. Crampton.
Caithness.	J. E. M'Connell.
J. G. Appold.	J. Nasmyth.
J. F. Bateman.	W. Smith.
W. M. Brown.	E. M. Shaw, Hon. Sec.

London, July 30.

ON THE UTILISATION OF THE POWER INVOLVED IN THE RISE AND FALL OF THE TIDES.

The tendency of modern scientific discovery has been to show that all the various forms of force with which we are acquainted are mutually convertible into one another. Thus, of the six forces known to us in connection with the universe — gravitation, motion, light, heat, electricity, and chemical affinity — it is well known that any one of the five latter is capable, by appropriate means, of generating the other four; the force of gravitation being capable, through the medium of motion, of giving rise to the other five forces, whilst it cannot itself be generated. Gravitation may therefore be assumed to be the elemental force, since it is the only one of the six which will generate all the others. So accurately have these correlations been studied, that the quantitative value of gravitation has even been ascertained, it having been found that the mechanical force required to lift 772 pounds to the height of one foot is capable, when converted into the force of heat, of raising the temperature of 1 pound of water 1° Fahr. In other words, this amount of heat may be generated by an appropriate utilisation of the gravitating pull exerted by a weight of 772 pounds during its downward movement through the space of one foot. Supposing, therefore, we were in possession of an unlimited number of 772-pound weights, and were to employ in the most judicious manner the force thus evolved in their downward progress, we should have an unlimited reservoir of power, which could be converted at will into light, heat, electricity, or chemical affinity, and could be made to toil for human benefit without any corresponding expenditure of human labour, so long as the weights continued their downward progress unarrested. If, however, any good were to be gained by such a machine, it must be managed so that the motive force — gravitation — should always remain on the pull, and this is, and always will be, the obstacle to the attainment of perpetual motion; the act of overcoming the force of gravity to re-raise the weights requiring the expenditure of exactly the same amount of power as has been generated during their downward fall; and so, before we can seriously discuss the feasibility of such a machine, we must find a perpetual flow of gravitating force always at hand, craving to be satisfied, and yet inexhaustible. In other words, we must construct a clock which will wind itself up when the weight has run down, without any expenditure of human power.

Sitting by the sea-shore a few days since, we could not help noticing the vast reservoir of mechanical power existing in the ocean. We do not refer to the noisy dash of the waves as they break upon the beach, but to the infinitely mightier, although silent and progressive, energy exerted in the gradual rise and fall of the tides. Compared with the stupendous power capable of being utilised for man's benefit, and present in the rise or fall of millions upon millions of tons of water through a space of ten or twenty feet, four times a-day, all the steam, water, or wind power in the world, together with the united muscular force of every living being, human and animal, sink into utter insignificance. We will try to form some idea of this power. Let us suppose that by the action of the tides the difference of level of the surface of the ocean at a certain spot is 21 feet between high and low water; omitting for the present all consideration of the power of the subjacent liquid, what is the mechanical value of a space of 100 yards square of this water? 100 yards square by 21 feet deep equals 70,000 cubic yards of water, which is lifted to a height of 21 feet, or to 1,470,000 cubic yards lifted to a height of 1 foot. Now, since one cubic yard of water weighs about 1,683 lbs., 1,470,000 cubic yards weigh 2,474,010,000 lbs., which is lifted in six hours. This is equivalent to lifting a weight of 412,335,000 foot lbs. in one hour; and since one horse-power is considered equivalent to raising 1,800,000 foot lbs. per hour, we have, locked up in every 100 yards square of sea surface, a power equal to a 230 horse-power steam-engine, acting, be it remembered, day and night to the end of time, requiring no supervision, and costing nothing after the first outlay but the wear and tear of machinery.

By means of appropriate machinery connected with this tidal movement, any kind of work could be readily performed. Water could be hoisted or air compressed to any desired extent, so as to accumulate power for future use, or for transport to distant stations. Light of surpassing splendour could be generated by means of magneto-electric machines; and with a very little exercise of ingenuity, every lighthouse on the coast could be illuminated with sun-like brilliancy, and with absolutely no expenditure of fuel; the very same mechanical power of the ocean which, in its brute force, would dash the helpless vessel to pieces against the rocks, being bound and coerced like the genii in Eastern tales, and transformed by man's intellect into a luminous beacon to warn the mariner against the approach of danger.—*Chemical News.*

HAY'S METHOD OF PROTECTING SHIPS AND OTHER STRUCTURES FROM DECAY.

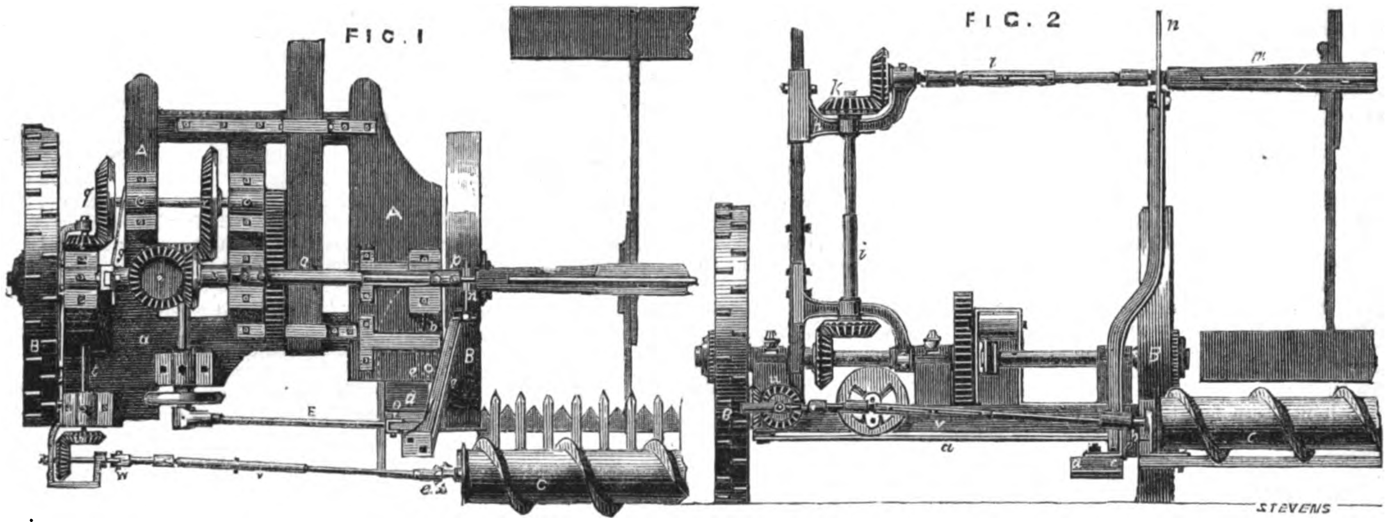
Mr. W. J. Hay, of Southsea, Hants, has obtained a patent for treating the oxides of copper and other metals, to prevent the uncertainty of their action by imperfect or not uniform application, when used for keeping ships' bottoms or other structures free from animalculæ and other animal and vegetable matters; also when used to preserve woods and other materials from decay and the ravages of insects. Black or protoxide of copper is ground and boiled with linseed oil until it is reduced to the suboxide, and by thus oxydising and oxydating the oil, a quick-drying cupreous oil is obtained, which suspends the oxide in the form of a paint or varnish. To this sometimes is added a small portion of silver or other metals and oxides. In some cases where greater durability is required from ships being in foreign stations, or not able to be docked periodically, an additional quantity of finely-ground suboxide or black oxide of copper is added. The paint or varnish may be thinned by spirits of turpentine, naphtha, or any other cheap spirits.

When it is to be applied to iron, one or two protective or non-conducting coats should be first applied. This may be red or white lead, paint or asphalte varnish, or waterproof glue in its liquid state, or other suitable material.

Mr. Hay also proposes to use zinc, either amalgamated or not, in contact with the inside or outside of iron vessels, ships' iron casings and other structures, as a protection against electro-chemical action arising from any imperfect application of the protective varnish, paint, or other material, or from the accidental abrasion of the said protective coatings or otherwise.

BURGESS'S PATENT REAPING AND MOWING MACHINE.

FIG. 1 FIG. 2



Most reaping machines at present constructed are unable, by reason of their great width, to pass along narrow lanes or through gateways. The present invention, patented by Mr. W. Burgess, of the firm of Burgess & Key, of Newgate Street, is intended to obviate this: —

The invention consists, firstly, in means of narrowing reaping, and mowing machines, to facilitate their passing along narrow lanes and through gateways. Fig. 1 of the accompanying drawings is a plan, and fig. 2 a back elevation of a portion of a reaping and mowing machine. To effect the narrowing, the frame A, containing the gearing, is supported upon two wheels B, B: to the lower part of this frame one or more bars *a*, *a*, are attached, which carry one or more travellers *b*, *b*. To the traveller is connected, by means of a hinge joint *c*, a shoe *d*, to which is fixed the finger beam, as also a standard *e*, for supporting the end of the reel next the frame. In order to prevent the traveller from shifting when the machine is at its full width, a hole is made through the back traveller, and a corresponding hole through the frame immediately above it, and a bolt is passed through both holes, as shown. The object of connecting the finger beam and traveller by a hinge joint is that the finger beam, reel, and delivery apparatus may be free to follow the irregularities of the ground.

The invention consists, secondly, in a mode of communicating motion to the reel. This is effected in the following manner: — Upon the axis of the main wheel or wheels is fastened a bevel wheel *f*, and by means of a collar on and through which the said axis is free to revolve, a standard *g* is fitted, and it is maintained in an upright or inclined position as may be required in the adjustment of the reel or otherwise by means of a stay. The stay is pierced with holes, and the standard is secured by a pin or bolt, which also passes through a hole in the standard fitted with two brackets *h*, *h*, to carry a vertical shaft *i*. The lower of these brackets is fixed, but the upper bracket may be raised or lowered at will (according to the height of the reel); at the lower extremity of the said vertical shaft is fastened a bevel wheel, which gears into the wheel on the main axis; higher up on the vertical shaft, and supported by the upper bracket above mentioned, is a bevel wheel *k*, so attached to the shaft as to revolve with it, but at the same time capable of sliding up and down on it according as the bracket which supports it is raised or lowered. The bevel wheel communicates motion to another bevel wheel, keyed on to a horizontal shaft *l*, supported at one end by the movable bracket and connected at the other with the reel shaft *m*, to which it imparts rotary motion. The horizontal shaft is formed with a tube or tubes, in which one rod or more fitted with universal joints is free to slide for the purpose of allowing the shaft to contract or extend according to the lateral movements of the reel in going over uneven surfaces. The standard *g* attached to the axis is capable of being moved more or less out of a vertical position by turning it on the axis, and by this means, together with an appliance to the standard *e*, which supports the end of the reel shaft next the frame, the reel may be raised or lowered, or placed either forward or backward as required. The arrangement adopted for this purpose is as follows: — On the top of the standard *e* a T rod *n* is fixed. This T rod is moved up and down and fixed in the desired position by means of a bolt, passed through holes in it and in the standard *e*. *p* is a traveller which carries the end of the reel-shaft, and is free to travel on the leg of the T rod. The motion for driving the delivery apparatus is communicated from the second-motion spindle, similar gearing being used to that employed for driving the reel; *q* is a bevel wheel on the second-motion spindle *r*; *s* is a beveled pinion on the shaft *t*, geared into by the wheel *q*, and giving motion through a pair of beveled pinions *u*, *u*, to a horizontal shaft *v*, similar to that employed for communicating motion to the reel shaft *m*, and fitted with a hinge *w*. The shaft *v* is connected to the apparatus C for delivering the cut crop from off the platform of the machine, and imparts motion to it.

FIG. 3.

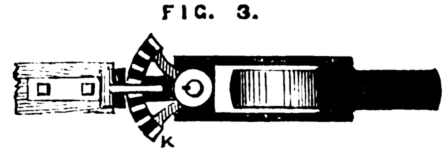
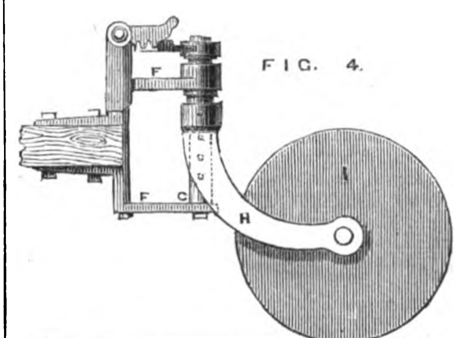


FIG. 4.



In order to narrow the machine, the bolts before mentioned are removed, which enables the upright standard *g* to incline forward; the knife bar D is disconnected from its connecting rod E, the shaft *v* is turned upwards upon the hinge *w*, and the travellers are slid along the bar or bars *a*, *a*, when the reel and the cutting and delivering apparatus will all move inwards to the extent to which the travellers are made to slide. In some cases a swivel wheel is used, which is free to follow behind the machine; the wheel is fixed in a frame, through the front of which a rod passes, so arranged that the wheel and frame can be raised or lowered on the rod so that the knife can be placed at any required height from the ground; on the top of the rod is fixed a quadrant, on the face of which are notches, and a trigger is so placed that it can be made to fall into one of the notches, so as to prevent the wheel from turning out of the line of draught of the machine when being backed. This swivel wheel, quadrant, and trigger are shown in plan and side elevation at Figs. 3 and 4. F, F, are supports fixed on to the back of the frame of the machine; G is a rod with holes, free to turn in bearings in the supports F, F; H is a frame carrying the wheel I, through one end of which the rod passes; the position of this frame on the rod G is regulated by a pin which is passed through an aperture formed therein and through one of the holes in the rod G; K is a quadrant with notches on its face, fixed on the top of the rod G; L is a trigger which, when required, is inserted into one of the notches to prevent the frame in which the wheel is fixed from turning when the machine is being backed.

MR. GLADSTONE ON ENGINEERS.

At the inauguration of the statue to Sir Hugh Myddelton, Mr. Gladstone concluded an eloquent address with the following observations upon engineers:—"It is a thing somewhat new in the history of mankind to erect in public places the statues of engineers. If we go back to the very first roots and beginnings of philosophy, we shall find that whatever related to mechanics and to physical force was associated with strictly and purely mental inquiries; but they soon came to be divorced one from another, and thousands of years elapsed before the engineer, as such, came to be recognised as a person having a high title to public distinction. It does not appear that the people of this country in very early times had developed much of the talent for which they are now so remarkable, and thus we see, in reviewing the history of the nation to which we belong, that at the later period of its career it has exhibited aptitudes of which there was no

trace at an earlier period. Let me say, in passing, that that is a useful lesson, not for nations only but for individuals, for it may teach an individual that there are many things at present wholly beyond his power, and for which he cannot even recognise in himself materials and fitness, and yet to which he may thoroughly and conspicuously attain by assiduous and resolute cultivation of the faculties which God has given him. No doubt the engineers who, under the name of architects, erected the cathedrals of this country, must have been persons considerable in their profession; but for much of their education we are indebted to foreign countries. It was rather in the main an imported than an indigenous quality; but in these later times we have seen a great change, and the engineers of this country have taken their place as one of the most important and most distinguished classes of the community. They have fairly taken their place amongst the great men of England; and I do not know whether any commemoration has yet been given to any of them so conspicuous as the erection of this statue of Sir Hugh Myddelton in one of the greatest thoroughfares of this vast metropolis. It is a fact full of meaning; it is an indication of the movements of the times, and the development of those faculties by which man is fitting himself more and more by the efforts of each generation in succession to contend with those difficulties of outward nature amidst which Providence has placed him for the purpose of evoking his energies, and to make the gifts and bounties of Providence available for his comfort and his happiness. This is the opening almost of a new chapter in the condition of man. I do not mean that it is the beginning of such efforts, but it is the beginning of them on a new scale, with a new system, with new appliances, and with new means for the intercommunication and interchange of knowledge; and it marks the fact that in the list of elements that belong to human civilisation these great operations of art and science, applied to the external world, must henceforward be included, and hold a conspicuous place; and it will be our own fault if the addition of that new chapter fail to be a great blessing. There is no reason why it should displace anything; and therefore let us not see in the distinctions bestowed upon the engineers anything that need fill us with fear or apprehension; and do not let us see in it the displacement of whatever has been done by man with respect to religion, art, or ancient learning. All these things ought to continue to grow and thrive, and that which we introduce we ought to add to what we have enjoyed before, and not substitute for what we have been enjoying. It is an immense blessing—it is a work of which we may confidently say that it is acceptable to God as well as to man—when water is brought from a distant spot to supply the population of this great city. It is all very well for most of us who are assembled here to make light of these great appliances of modern engineering, and to think that it does not signify whether we are carried fifty miles an hour or five—whether our houses are well drained or not, and whether the water of the country is brought to feed London. It is all very well for us to assume a high and sanctimonious tone and say, 'Do not let us overwhelm these temporal goods and comforts.' It is wise that the poor should be remembered; and I have no doubt that the ministers of religion will take care to remind them that they are not to suffer their minds to be absorbed and dried up with the continual contemplation of temporal and physical necessities, but ever to lift their eyes up to the God that is in heaven; but language such as that need not be held amongst the wealthy. Let us freely and gratefully acknowledge that those who, like Sir Hugh Myddelton in former days, devote themselves with energy, forethought, care, and skill to the multiplication of appliances which conduce to the comfort of man, and to conquering the forces of nature and making them subservient to human happiness, are doing a great and good work before the face of Heaven as well as before the face of man, and deserve to be held in grateful honour as real and genuine benefactors of mankind."

JEAUNEAU'S ROAD-SWEEPING MACHINE.

FIG. 1

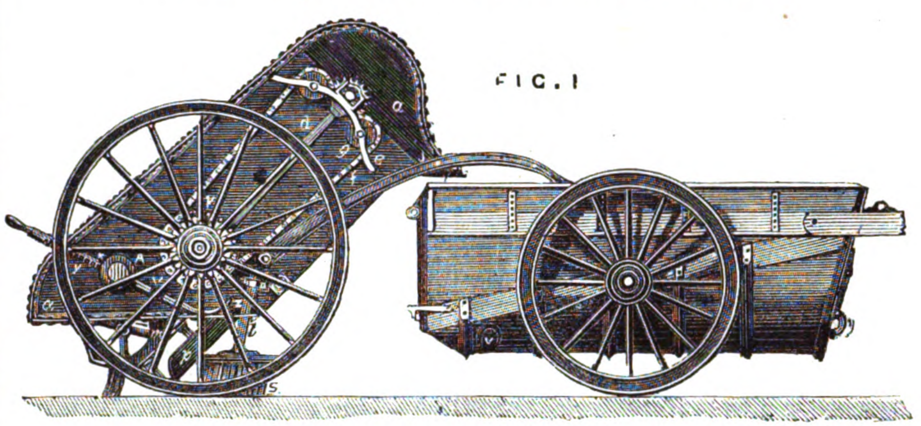
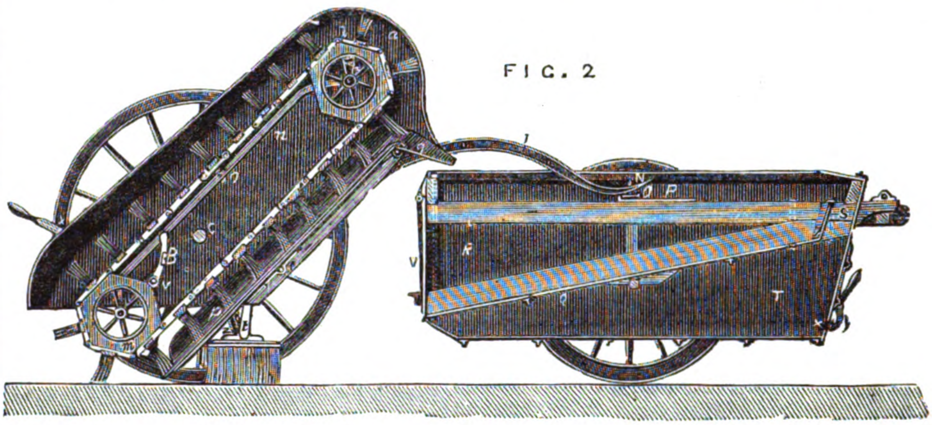


FIG. 2



Monsieur Jeauneau, of Cosne, France, has patented an improved machine for sweeping roads and streets, parts of the machine being applicable to separating liquid from solid substances.

Fig. 1 of the accompanying engravings is a side elevation, and fig. 2 is a longitudinal section of a sweeping machine, constructed according to this invention. *a* is the case or frame, made by preference of sheet iron, and strengthened by angle pieces and supports. This case is open at the end. *c* is the main or driving axle which passes through the sides of it. *d* is a guide bar terminating in a bracket *e*, supporting the bearing *f* and the pulleys *g g'*. The axis *h*, on which the pinion *i* is keyed, is free to revolve in the bearing *f*: this pinion gears into the teeth on the endless chain *j*, which is driven by the toothed wheel *k* on the axle *c*. *l* is a polygonal drum mounted on the axis *h*, inside the case *a*. This drum is connected to another and similar drum *m* by means of the frame *n*; a roller *o* supports the weight of the chain. During the upward motion of the brooms, the dirt is drawn into the passage *p* to the shoot or guide *q*, and thence into a receiver. The conduit *p* is free to move upon an axis *r* in such manner as to remain parallel with the chain of brooms, however much the latter may be worn. *s s* are side brooms, one only of which is seen; they are placed at an angle with the line of draught, so as to guide the dirt into the line traversed by the brooms. These brooms *s s* are united to knee-pieces *t*, which slide in a guide fixed outside the case *a*. The height of the chain of brooms from the ground is regulated in the following manner:—On the shaft *v*, which is fixed to the case *a*, the lever *x* is free to move, the position of the weight A being regulated by the rack *y*. To this lever *x* the forks B are fixed, so that by depressing the end of the lever *x* the frame *n* is pushed back, and, consequently, the drum *m* and with it the chain of brooms is raised from the ground. A similar motion of the lever *x* raises the side-brooms by means of the chain *z*, which is fixed to its other extremity. A chain is used in preference to any other connection, because, by means of the links of which it is composed, its length can be easily adapted to suit the wear of the brooms. The clutch arrangement D slides on a collar on the shaft *c*, and abuts against the springs E fixed to the outer side of the case *a*. The clutch is provided with inclined catches, which take into corresponding apertures formed in the nave F of the driving wheel. The springs E tend to press the clutch against the nave of the wheel, so that when the machine advances the running wheel draws with it the clutch as well as the wheel *k*, which forms part of it. If the machine moves in a contrary direction, or backwards, the box F presses against the teeth of the clutch D, which compresses the springs E and stops the motion. G is a bearing fixed to the frame *a*. H and I are internal and external strengthening pieces for supporting and keeping together the case or frame of the machine. The chain *j* is composed of metal plates held together by pins on each side, and which enter the notches in the toothed wheel *k*. The pinion *i* is arranged in a similar manner. Any other construction of toothed wheel and chain may, however, be employed. The sweeping machine is attached to the receiver by shafts J J fixed to the sides of the frame; the ends of these shafts are united to form a sort of stay, through which a gudgeon N passes, fixed to a horizontal metal cross-bar O. This cross-bar is itself held by two hooks P placed on each side of the receiver, which is divided centrally by the inclined partition Q. The dirt, rubbish, mud, and materials which are swept up the conduit by the brooms and thence conveyed by the spout *q*, first fall into the compartment R, the liquid portion passes to the compartment T by the aperture S, while the heavy portion sinks in the compartment R, from whence it is removed by the door U. V V are apertures one on each side of the receiver, but one only of which is seen, by which the contents of the compartment T are emptied. When it is desired to use the liquid portion for watering the road, the orifice X is opened by raising the plug Y, which is fitted with a rose or spreader. By

the construction of this apparatus streets and roads are swept, the mud is washed, the sand extracted from it, the liquid portion thereof employed for watering the roads, and the heavy thrown into sewers or other receptacles for manure and other purposes.

NOTE ON THE HISTORY OF THE DYNAMICAL THEORY OF HEAT.

By J. P. Joule, LL.D., F.R.S.

To the Editors of the Philosophical Magazine and Journal.

Gentlemen,—Will you permit me to trouble your readers with a few remarks on the subject of my friend Professor Tyndall's lecture at the Royal Institution, reported in your last number? In this lecture he enforces the claims of M. Mayer, a philosopher whose merit has perhaps been overlooked by some of our English physicists, and unaccountably so by his fellow-countrymen. I myself was only imperfectly acquainted with his papers when, in good conscience and with the materials at command, I gave a sketch of the history of the dynamical theory of heat, in my paper published in the Philosophical Transactions for 1850. M. Mayer's merit consists in having announced, apparently without knowledge of what had been done before, the true theory of heat. This is no small merit, and I am the last person who would wish to detract from it. But to give to Mayer, or indeed to any single individual, the undivided praise of propounding the dynamical theory of heat, is manifestly unjust to the numerous contributors to that great step in physical science. Two centuries ago, Locke said that, "Heat is a very brisk agitation of the insensible parts of the object, which produces in us that sensation from whence we denominate the object hot; so that what in our sensation is *heat*, in the object is nothing but *motion*." In 1798, Rumford, inquiring into the source of heat developed in the boring of cannon, observed that it was "extremely difficult, if not quite impossible, to form any distinct idea of anything capable of being excited and communicated, in the manner the heat was excited and communicated in these experiments, except it be motion." In 1812, Davy wrote, "The immediate cause of the phenomena of heat, then, is motion, and the laws of its communication are precisely the same as the laws of the communication of motion";* and he confirmed his views by that original and most interesting experiment in which he melted ice by friction. In 1839, Séguin published a work entitled "De l'Influence des Chemins de Fer." He shows that the theory generally adopted would lead to the absurd conclusion that a finite quantity of heat can produce an indefinite quantity of mechanical action, and remarks (p. 328), "Il me parait plus naturel de supposer qu'une certaine quantité de calorique disparait dans l'acte même de la production de la force ou puissance mécanique, et réciproquement." At p. 383 he remarks, "La force mécanique qui apparait pendant l'abaissement de température d'un gaz comme de tout autre corps qui se dilate, est la mesure et la représentation de cette diminution de chaleur." In p. 389 he gives a Table of the quantity of mechanical effect produced corresponding to the loss of temperature of steam on expanding. From this it appears that 1° Cent. corresponds with 363 kilogrammes raised to the height of 1 metre. At p. 403 he states, "Je bornerai là mes réflexions sur un sujet dont chacun saura apprécier l'importance. Du calorique qui est employé par l'industrie à produire de la force, et aux usages domestiques, une faible partie seulement est utilisée; une autre quantité bien plus considérable, et qui pourrait suffire à créer d'immenses valeurs et à augmenter d'autant la richesse nationale, se trouve absolument perdue." From the above extracts, it will be seen that a great advance had been made before Mayer wrote his paper in 1842. Mayer discourses to the same effect as Séguin, but at greater length, with greater perspicuity, and with more copiousness of illustration. He adopts the same hypothesis as the latter philosopher, viz., that the heat evolved on compressing an elastic fluid is exactly the equivalent of the compressing force, and thus arrives at the same equivalent, viz., 365 kilogrammes per 1° Cent.

It must be remarked that, at the time Séguin and Mayer wrote, there were no known facts to warrant the hypothesis they adopted. There was no reason to assert that the heat evolved by compressing a gas was even approximately the equivalent of the compressing force. This being the case may account for the inattention of the scientific world to these writings. The dynamical theory of heat certainly was not established by Séguin and Mayer. To do this required experiment; and I therefore fearlessly assert my right to the position which has been generally accorded to me by my fellow physicists as having been the first to give a decisive proof of the correctness of this theory.

In saying this I do not wish to claim any monopoly of merit. Even if Rumford, Mayer, and Séguin had not produced their works, justice would still compel me to share with Thomson, Rankine, Helmholtz, Holtzman, Clausius, and others, whose labours have not only given developements and applications of the dynamical theory which entitle them to merit as well as their predecessors in these enquiries, but who have contributed most essentially in supporting it by new proofs.

Permit me to remark, in conclusion, that I applied the dynamical theory to vital processes in 1843;* and that in 1847, in a popular lecture published in the *Manchester Courier*, I explained the phenomena of shooting-stars, and also stated that the effect of the earth falling into the sun would be to increase the temperature of that luminary.† Since that time Thomson, by his profound investigations, has made the dynamical theory of heat, as applied to cosmical phenomena, his own.

I sincerely trust that, by the foregoing remarks, I have done no injustice to Mayer, especially as I grieve to hear that sickness has removed him (I hope for only a short time) from the science to which he has contributed with so much ability. The reproduction of some of his papers in the "Philosophical Magazine," particularly that "On the Forces of Inorganic Nature," would, I am sure, interest many of your readers, and enable them to fully appreciate his just claims.

I remain, Gentlemen,
Yours respectfully,
J. P. Joule.

THE PHYSIOLOGY OF SEA-SICKNESS.‡

By Richard Meade Bache,
Assistant U. S. Coast Survey.

All that is known about sea-sickness is, that certain involuntary motions of the body produce an effect upon the nervous system. This effect results in nausea. This nausea is called sea-sickness. The question is not solved, as to the manner in which the nervous impression is produced.

It is generally supposed, that sea-sickness is produced by the mere motion of the body, and consequently of the stomach. That it is produced by motion, is not to be denied, but as wherever sea-sickness occurs, motion is the pervading concomitant of existence — the thing most patent of all that is evident to the senses, and the body is so unpleasantly subjected to it, we lose sight of the fact, that with the body are also subjected all the senses or perceptive faculties, and that these are called upon to comprehend an entirely novel state of existence.

I have said, that the mere action of motion upon the body is supposed to produce the nausea called sea-sickness. I hope to be able to overthrow this theory by the arguments and proofs of another theory, which I am about to advance.

The points which I intend to prove are — that the agreeableness of motion is a mere matter of habit—that motion, however violent, is not nauseating per se, but only inasmuch as it produces an impression conflicting with its ordinary contrasted effects as pre-established in the mind, that the idea of motion is the result of concurrent testimony of the senses—and, that in novel motions, there is a violation of the conception of motion derived from the habitual concurrence of the testimony of the senses—that as the result of this violation, a conflict of impressions ensues, and the brain is affected—thence the nervous system, and nausea results. In fine, I maintain that sea-sickness is a disease of the brain, and not of the stomach, except incidentally, or as affected by the brain, although it is true that the stomach reacts upon the brain.

I now commence my argument, in which I have attempted a procedure which, I trust, cannot fail to bring conviction of the truth of the theory to any one who will carefully analyse it. In all statements of facts which I have introduced I have taken the experience of others, as well as my own.

The appearance of motion when the observer knows that his own body is at rest, is not nauseating. To ascertain the effect of the mere appearance of motion under these circumstances, we can take no better example than that of a train of cars drawn by a locomotive at full speed. The more rapid motions of the heavenly bodies are not appreciable by our senses. We have conception of them through the mind, but not through sight or hearing, therefore I have chosen the motion of railway trains for the purpose of illustrating the effect of the mere appearance of motion. Standing as near or as far off as one pleases, from a train of cars in rapid motion, no more nauseating effect is produced upon the spectator than by the sight of any object at rest. Yet the appearance of motion is nauseating in *two* cases—but these are where the idea of motion of the body is involved, that is where motion of the body of the observer is either in *debate* by the mind, or *acknowledged* by the mind and the motion is not *felt*. If this can be made to appear, it is additional proof that the mere appearance of motion is not nauseating, or as I shall henceforth express it for convenience, the appearance of motion is not nauseating per se. As an example of the first case—that the appearance of motion is nauseating "when motion of the body of the observer is in *debate* by the mind"—take the following: In a dimly-lighted depôt, two trains of cars stop side by side—presently one starts—so gently that an occupant of one of the trains cannot decide whether it is his own train which is in motion, and consequently whether it is his own *body* which is in motion, or whether the motion perceived is that of the other train. This produces a sensation of uncomfortableness — of giddiness — indicative that nausea would result if the effect were continued. At all events, it produces an impression of motion of the body, which impression is derived through the instrumentality of the sight, and which impression affects the nervous system unpleasantly—yet the body of the observer may have been at rest all the while. As an example of the second case—the assertion "that the appearance of motion is nauseating when motion of the body of the observer is *acknowledged* by the mind, and the motion is not *felt*," one illustration, as in the first case, will suffice. In the slight trembling of an earthquake, when the jar would have escaped notice but for the faint oscillation of a chandelier which calls attention to the existence of an earthquake—this oscillation, through the impression which it gives the observer that his body is in motion, often causes the sensation of nausea. It is impossible that the motion of the body of the observer could cause the sensation, for the case spoken of is one where the existence of the earthquake would not have been known, but for the oscillation of the chandelier. The sensation could not have proceeded from the mere perception of the motion of the chandelier, because such an object can be viewed while swinging violently, without any sensation being produced, other than the perception of its swinging.

The cause of the disagreeable sensations just described, is owing to the fact that nature requires our senses to keep pace. The sight must not proclaim what the feeling does not at once corroborate,

* Elements of Chemical Philosophy, p. 49.

* Phil. Mag. S. 3. vol. xxiii p. 442.
† Ibid. vol. xxxii. p. 350; and *Manchester Courier*, May 12, 1847.
‡ Read before the Connecticut Academy of Arts and Sciences, January 15, 1862.

and vice versa. In the first case, nervous impression was produced by doubt in the mind of the observer as to whether his body was or was not in motion, and in the second case, by the consciousness of motion of the body, which motion was not *felt*. In neither case did the senses keep pace, consequently the nervous impression ensued, and consequently nausea. It is evident, although the sight was the agent in these results, that it was *only* the agent, and it was the imagination which produced the effects. Sight was the intermediary. It may be safely inferred from the effect of the appearance of motion in the two cases just cited—that if a man, believing himself in his senses, should see a landscape glide by, he would become nauseated, yet it is evident that the nausea would proceed from the involved idea of motion — the idea that he might be in motion without feeling it —for if he knew it was only the landscape which he saw that was in motion, he would regard it with terror, but without other sensation, and it would affect him as a passing train of cars when he knew that his own body was at rest—that, is, it would not affect him at all, as far as nauseation is concerned.

We see, then, that the appearance of motion per se does not nauseate, and we see too how the nervous system is impressed by the imagination so as to bring about nausea.

The senses from the earliest infancy have grown up and been educated together to act in harmony. It requires habit to render them capable of keeping pace together in a novel condition of existence. The motion communicated to the body by riding in a carriage is by no means violent, notwithstanding which, persons in early life frequently become nauseated while thus riding. This is merely because the sense of sight and the feeling of a certain motion have not been educated together. This I shall proceed to show. It is well known that persons perfectly habituated to riding in a certain position in a carriage, object to riding with the back towards the direction in which they are proceeding, on the plea that it makes them sick to do so. It doubtless has that effect, but it is impossible for the effect to be produced by the mere motion in that position, for it is impossible, in a carriage in motion in the dark, to decide in what position one is sitting in relation to the line of progress, unless some obstacle should interpose, or the road should be so bad as to afford an equivalent to a number of obstacles in the way, or unless the driving is of such a character, by sudden turnings and abrupt increasing or slackening of speed, as to indicate to the occupant of the carriage the position in which he must be sitting. In a word, in ordinary conditions of progress in a carriage, it is impossible in the dark to determine in what position one is sitting. This is not generally known. Experiment will prove my assertion to be true.

It has been already shown that the appearance of motion per se does not nauseate. How then is a person accustomed to riding in a carriage nauseated by riding with the back towards the direction in which he is proceeding, for the appearance of motion per se does not nauseate, nor can motion per se nauseate in *that* instance. The effect is derived from consciousness of motion perceived by two senses at least, while at the same time the appearance of objects violates the habitual impression produced by the sight of them. In the dark, the effect must be derived from pure imagination. If we grant then that a particular mode of progress in a carriage can nauseate one accustomed to a carriage (and it is often seen), and we grant at the same time that appearance of motion per se is not nauseating (and this I have proved), and we know also, in the case spoken of, that motion per se could not have produced the sensation of nausea (because the motion is the same in any position, and the person is habituated to one), we must then acknowledge that the nausea is produced neither by the motion per se, nor by the appearance of motion per se, but by a conflict of the two senses of feeling and sight. If this can be inferred in the case of one accustomed to the motion of a carriage, it must apply with more force to one unaccustomed to it.

So thoroughly have the senses created a conception of motion, that the exclusion of sight does not alter the idea of its appearance, nor alter the idea of the appearance of violation of preconceived effects. The mental picture is always present. If the exclusion of the sight did alter these ideas, the closing of the eyes would, in one of the cases just mentioned, save from nausea a person unaccustomed to riding in a certain position, and in the other case would secure immunity from nausea to the person unaccustomed to riding at all. But it does not save them, which shows that the mental picture of progress and of unwonted effects takes the place of that produced by actual vision. It is immaterial whether the sight is acting or not acting. Whatever senses exist in an individual, have conjointly created a well-defined idea of the contrasted effects of motion, and this conception is always evident to the mind without the continued intervention of all the authors of the conception.

Having shown that a certain motion is nauseating, but is not nauseating per se, we may fairly infer that no motion is nauseating per se. Perhaps in very violent motions, there may be some mechanical effect produced by the movement of the stomach — this is not a primary cause of sea-sickness, but an aggravation of it. Otherwise, it must be supposed that the stomach of a sailor becomes entirely changed in its nature.

The law to be deduced from what I have attempted to demonstrate is this — that the violation of the habitual conception of contrasted effects of motion, is the cause of the nauseation which occurs during novel motions — and the cause is not motion per se, nor the appearance of motion per se.

If such effects as those just described in the case of riding in a carriage can nauseate when they are produced by comparatively slight changes in "the habitual conception of contrasted effects of motion," it is not surprising that the effect of motion at sea should bring the great and continuous nausea called sea-sickness. The motions of a ship vary infinitely. As soon as a certain kind of motion has lasted for a long time, the voyager becomes accustomed to it, and he has no more tendency to become nauseated than has the man accustomed to a carriage. He may, however, become sick again if the motion should vary and yet not be increased. A person habituated to the sea may remain ashore for a long time, but his senses readily accommodate themselves again to conditions once understood. It is true that even old sea captains are sometimes afflicted by sea-sickness, but this does not invalidate the theory which I have advanced. There are temperaments so predisposed to sea-sickness, that the inuring process has to be perpetually renewed. I do not assert that the same amount of experience at sea gives the same immunity to each person. The causes which I have mentioned as superinducing sea sickness affect every one, but the capability of resisting it varies with every temperament. There are individuals who never become sea-sick—that is to the extent of succumbing to nausea — but they undergo the same process of education of the senses. The difference between these persons and those who do succumb, is that their organizations in physique and temperament enable them to resist the inclination to nausea, and the education of the senses is completed before nausea has been able to overcome them, although it always attacks. There is no one who in a first experience at sea is not disposed to nausea, but there are some few persons who possess such organisations that, with the aid of a firm determination to resist an attack of sea-sickness, they are enabled to escape it, and to pass the ordeal of the novel motion at sea without manifest inconvenience.

(To be concluded in our next.)

It is said that a contractor for guns for Government is making one hundred and fifty thousand pounds a year profit!

TO CORRESPONDENTS.

Received — E. E. A., F. & Co., A. M., H. N. H., J. B., J. P. D., G. C., R. T., T. M., H. R. M., H. & T., H. P., E. E A., Dr. R., Capt. B. T., J. H. T., J. A., W. B., yes, W. H. F., J. H.

Correspondence.

[We do not hold ourselves responsible for the statements of our Correspondents.]

THE STRAIGHT LINE *VERSUS* THE WAVE LINE FOR VESSELS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR, — Mr. Cheverton's request is very curious, "that I would hand over the defence of the wave line theory to some one more competent to discuss it." I have already several times referred him to Mr. Scott Russell's elaborate papers; Mr. Cheverton does not say whether he has done so; but, alas for me, he condemns Mr. Scott Russell and Mr. Macquorn Rankine as well as my humble self. Being censured in such company, I really must imitate Lord Palmerston, and say I am proud to differ from him.* Before attacking any established scientific fact, it is generally considered not only prudent but absolutely necessary to become acquainted with the best works upon the subject; but I must conclude that Mr. Cheverton either has found the royal road to learning, or is profoundly ignorant of the subject he writes upon.

Mr. C. says, "the adoption of hollow lines is rather prevalent, and it is much to be regretted that it should be so, if the practice is bad." Just so say I — *if the practice is bad!* But it so happens that the practice is good; and so good that if a man wants speed in his vessel he adopts the wave line system and obtains it; and almost every fast ship in the world is constructed upon that system, more or less fully carried out. And I can tell Mr. C. that the Warrior and many other well-known vessels could not carry power enough to drive them at their present speeds with straight line bows of the same length as those they have on the wave line system.

Mr. Cheverton says, "Mr. Moy will excuse me from noticing his observations on uniform motion; they are, I can assure him, random remarks, without pertinency or point."

I am not in the habit of making *random remarks*, and my observations I consider exceedingly pertinent to the question, and I now repeat them in the strongest language I can use: *that there is no possibility of forming the bow of a vessel in such a manner as to drive the water from the central line of the vessel's course to its sides, at an uniform velocity.*

I will now show that the straight line bow cannot produce uniform motion. Take the example of the pier of a bridge in a tide-way, many of which may be found with straight lines beginning at an angle and joining the sides with a short curve. The water becomes heaped up at what may be termed the stem, from its motion being suddenly arrested, and the impossibility of its motion being as suddenly diverted in a new direction. By thus rising in the form of a bow wave it is enabled to run down hill towards the sides, which it does at a very irregular velocity, and when it has arrived *just so far as it should go and not a jot farther*, it has gained too high a velocity in this direction and shoots beyond the sides of the pier, and, in passing the pier, encloses a mass of dead water between the moving water and the pier. This clearly proves that the straight line fails to impart uniform motion, and, even with the help of a curved junction with the side, fails to transfer the water quietly to its new channel.

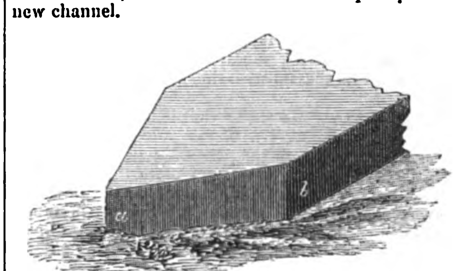


Fig. 1.

Again, let *a b*, fig. 1, be the bow of a vessel (shown in perspective) formed on the straight line in its

* To the disgrace of Lord Palmerston.—ED. M. M.

integrity. The water met at the stem a should pass quietly to b, to do which it is requisite to pass suddenly into lateral motion at a, and as suddenly to lose that lateral motion at b. Nothing of the kind, can however, take place; but a similar bow wave, as in the case of the pier of a bridge just mentioned, will arise, with the same irregularity of motion.

A word or two now about the wave line. Let the end of the extended guide rod d of the slotted cross-head and piston rod, fig. 2, mark out the form of bow

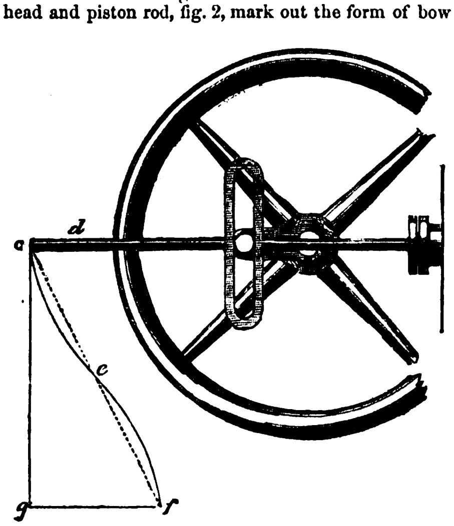


Fig. 2.

we want. Let $c\ g$ be the length of bow required, $g\ f$ the half breadth of the beam. Let the fly-wheel revolve at an uniform velocity for half a revolution, drawing (by its crank pin) the slotted cross-head, &c. back towards the cylinder. At the same time, let $c\ g\ f$ be moved also at an uniform velocity, so that when the piston has completed its in-stroke the point of d will touch f; this will trace the curve $c\ e\ f$. The dotted line is the straight line bow. The perfect line is the wave line.

Now with this form, at c the water is gently forced to move, at e it has attained its greatest velocity, and from e to f it gradually loses that velocity, at f it has no motion whatever, it has been moved as far as is necessary, *and not a jot farther*; no *vis viva* remains in it. You may now continue with a parallel middle body, or the stern curves may at once commence; no dead water is dragged along the side, simply because no attempt is made to treat the water unnaturally, no sudden and violent motion is attempted, but the form of bow is made to accommodate itself to the nature of the element upon which it must act.

I am, Sir,
Your very obedient servant,
T. Moy.

1 Clifford's Inn, Aug. 4, 1862.

THE "SLEEPING PARTNERS" OF ELSWICK.

Sir,—The zeal which you have manifested in opposition to the notorious "Armstrong gun" job is well worthy the notice of the Legislature; and Mr. Bernal Osborne's remark, "the sleeping partners of Elswick," is full of meaning; but the "sleeping partners" must be named, and that without reserve, before the public can hope to be relieved from this expensive gun job, of which we have all a right to complain.

The justice of the question is ignored by "back-door" influence; and so it will remain until the Legislature shall have the moral courage to require the names of all mixed up with this great national delusion.

Mr. Bernal Osborne states that it has already cost about or over 3,000,000*l.* of the public money, and that England is not in the possession of a single gun such as her future interest and protection demand. Of this I am very well aware; and I am also aware, as every honourable man must be, if it is attributable to the demoralising party compact which still forces this costly gun into use, it is the duty of the House of Commons to demand an open and full investigation instanter into the secrets of this notorious State transaction; and, although I am not prepared to say that all I have been told, and all I have read in your valuable Magazine and other professional papers, be literally correct, I know quite enough to be in a position to state, the Government is bound to make public what it knows, and that it knows quite sufficient to put a stop to the practices resorted to to keep up the delusion.

It is well known, in the first place, that Major-General Peel, when Secretary of State for War, handed over about 8,000*l.* of the public money to a Mr. William Armstrong, to make the first example at Newcastle; and it is also well known, after the example gun was made, Major-General Peel adopted the gun in the service, and gave to Mr. William Armstrong a public grant of 20,000*l.*; and subsequently that the Government made Mr. "Sir" William Armstrong, for his presumed services in this delicate affair; but it is not so well known as it should, that Major-General Peel refused to ascertain the merits and justice of the question before he undertook to close the bargain with the "sleeping partners" of Elswick.

That the then Mr. Armstrong and the Major-General were not of sufficient importance to do this thing on their own responsibility, every reasonable man must be aware; and it is much to be regretted that the "free institutions" of this enlightened country should admit of covert irresponsible influence to complete what two individuals of minor importance in the State could not venture to undertake unknown to those who, we are told to believe, are responsible for the expenditure of the public money.

How many there may be directly and indirectly interested as "sleeping partners," I am not aware; but if there be six, each must have shared a very considerable trade profit out of the amount, 3,000,000*l.*, as named by Mr. Bernal Osborne.

The trade profit cannot amount to less than 700,000*l.*; or at the rate of or above 100,000*l.* for each, if there be six "sleeping partners" in the Elswick gun firm — a nice little sum to be cleared in or about four years; and it is not very surprising that every effort to get at the truth should be so patriotically burked by those who have the power, under present painful circumstances, to keep up the works at Elswick. Major-General Peel, if called upon, can surely name the parties with whom he entered into a bond of 85,000*l.*, to keep up the Armstrong gun establishment; but if he should presume not to recollect, Sir George Cornewall Lewis can produce all the papers to be found at the Pall Mall establishment; and no doubt he will gladly do so if Mr. Bernal Osborne, or any other member of the House of Commons, will press the subject to a clear and honourable conclusion.

It is presumed by many, the "sleeping partners" are too strong to yield to the wishes of the Legislature, or that it will be injurious to the credit of the State to make everything known from the beginning, so far as the "Armstrong gun" is concerned; but this, in my humble opinion, is a very injurious fallacy, and the sooner exploded the better; but if the members of the House of Commons are inclined to dispose of the question more promptly, let them pay over to the "sleeping partners" of Elswick the 85,000*l.* bond, and have done with the question; and Sir Cornewall Lewis will then be free, and, as it is to be hoped, will at once proceed in procuring such a gun as we are assured the public service is much in want of.

Observer.

London, August 4.

SHOT-PROOF SHIPS.

Sir,—It is stated in your number of the 18th inst., that proposals and plans under this head submitted to the Admiralty between May 1, 1859, and May 1, 1862, amounted to 590. Is it to be understood by this return that there was no suggestion of the kind made prior to May 1, 1859, because, as a matter of historical truth, I beg to state that I hold letters which show that I proposed to Sir James Graham to construct vessels shot-proof of iron, as early as May, 1854? The leading feature of my plan consisted in forming the outside shell of iron plates placed so as to receive the impact of a shot on their edges, similar to a model now at the Royal United Service Institution, but the idea of making wooden vessels invulnerable to Artillery by covering them with armour-plates never entered my head as practicable; I directed my attention to this subject some ten years before, when news reached England that shot had perforated one of Her Majesty's ships in the Rio de la Plata. It was then first found out, or erroneously supposed, that iron was not adapted for ships of war; it appeared to me, however, that if a ship were made of iron as strong as the iron breech of a gun, a fulcrum for the force which projected a shot, it would not penetrate the former. The defect lay in the way of using the material, not in the material itself. The ultimate adoption of my inventions by others more favoured, in relation to rendering steam-ships shot proof, beginning with the submerged screw shaft, in 1834, to the adoption of the curved in lieu of the radiating section of a screw, exhibited by me in 1851, and viewed then as a scheme, justify me in believing that the shell of shot-proof vessels must sooner or later be formed of plates of iron placed edgeways.

I am, your obedient servant,
George Beadon.

July 31, 1862.

P.S. In 1859 I consulted Sir Baldwin Walker, by letter, as to taking a secret patent, because I felt that its adoption by a foreign power would render our fleet comparatively useless. Had we gone to war with America, can anyone doubt that our line-of-battle ships would have been no match for Monitors or Merrimacs? My experience leads me to disbelieve all history. The Apostles generally reap the credit and reward of any benefit conferred on the community by an individual. G. B.

FORTIFICATIONS FOR GLASGOW.

Sir,—It is a very extraordinary thing, that after reading so many letters and speeches lately about forts and fortifications, that we Glasgow people never saw the unprotected state of our own town till this week. When I read your short description of Walker's new floating battery, and looked at the engraving, the whole thing flashed across my mind at once, that Dumbarton Castle, we had put so much faith in so long, had really become a thing of the past.

This is really and truly a fact — a vessel with a speed of twelve miles an hour would pass before a shot could be fired from the castle to do any damage.

Well, sir, seeing that clearly, would it not be wise policy for us to have a powerful battery constructed of our own, one with ten guns, at least; it might, for old associations, be called Dumbarton Castle; only let us be safe from evil-disposed persons, as you very properly call them.

Glasgow, no doubt, feels the blight that has fallen upon so many manufacturing towns, but still there is spirit enough left to take care of herself—it only wants a beginning; and you, sir, might give us a word of encouragement. I should like to see Glasgow take the lead in this as she did in steam-boats sixty years ago. We have the materials and the men; the Government would, perhaps, give us the guns; and so ultimately the Clyde would stand A 1 amongst the rivers of the earth.

We remain, sir, yours respectfully,
Foster & Co.

Glasgow, August 1, 1862.

Gossip.

At the annual dinner of Messrs. Worssam's employés, at the King's Arms Hotel, Hampton, last week, Mr. Worssam, in responding to his health, said there had appeared, in a recent number of the *Engineer*, under the head of "Wood-working Machinery," an article which, although he had before given that journal credit for impartiality in representing the merits of inventions and improvements, he could not place within the range of that category. The writer displayed but a very limited knowledge of wood-cutting machines, since he only dated from the year 1850, and he (Mr. Worssam) imagined that his knowledge had grown with the growth of Messrs. Robinson's, and dated from the time that they first thought of making wood-working machines. The fact, however, was that Messrs. Powis and James had exhibited a superior machine; Messrs. M'Dowall had a first class machine for the same purpose and for planing; and Messrs. Forrest and Barr, as well as themselves, had others.

The problem of drawing aluminium into wire has been resolved by M. Garapou, of Paris, an artizan, who now conducts the operation in a truly workman-like manner. He furnishes the aluminium wire at from 60 to 100 per cent. cheaper than silver wire of the same length. The price of aluminium is always about 200 francs per kilogram. For the purpose of drawing it into wire they commence with rods of aluminium of one mètre in length and twelve millimètres diameter — these the inventor easily reduces to wires of the size of a hair, and many hundred kilomètres in length. These products appear in the International Exhibition, where are exhibited articles of lace work, such as epaulettes, embroideries, textile fabrics, entire head-dresses, with mounting and ornaments constructed entirely of aluminium. These articles are remarkable for their lightness, and they show that a novel manufacture has been created by the new process of drawing aluminium into very fine wire.

The report of the directors of the Electric and International Telegraph Company states that the gross revenue for the last six months amounts to 102,367*l.*, against 102,519*l.* in the corresponding period of 1861. The working expenses present few marked features. The maintenance charge is somewhat less, but may probably be proportionately increased during the current half-year. One considerable item—viz., that for law and parliamentary expenses—appears in the balance sheet. The board consider it right to charge the whole of the expenses of the late contest with the United Kingdom Telegraph Company against the revenue of the half-year, and no debt on this account will remain on the company's books. Deducting from the gross revenue of 102,367*l.* the working charges and interest amounting to 71,131*l.*, which includes the exceptional item of 6,056*l.* alluded to, there is a clear profit of 31,236*l.* on the operations of the six months, and the directors are consequently enabled to maintain the usual dividend of 3*l.* 10*s.* per cent. for the half year, which will absorb 29,816*l.*, leaving a balance of 1,420*l.* to be added to the account for the renewal of the submarine cables. It is mentioned in the report that in order to pay for various extensions, the last instalment on the new shares will be immediately called up.

In the House of Commons, on Wednesday (week) Mr. Lowe, in reply to Mr. Jones, said that the greatest pains were taken that the ventilation of the schools which were assisted by the Government should be attended to, and there was no reason to believe that such ventilation was in a defective state. As to the process of Mr. Cooke, of Spring-gardens, which had been applied to the Colonnade Institution, Clare-market, he (Mr. Lowe) did not know what it was, but the educational department were always happy to hear suggestions on the subject.

The directors of the Algerian Cotton, Land, and Irrigation Company, which is established under the protection and support of the French Government, have received a copy of the concession from the Governor-General of Algeria. Its terms are more favourable than those published in the original prospectus, inasmuch as they confer a right to the water as well as to the land in perpetuity, while all the other valuable privileges previously conceded are confirmed.

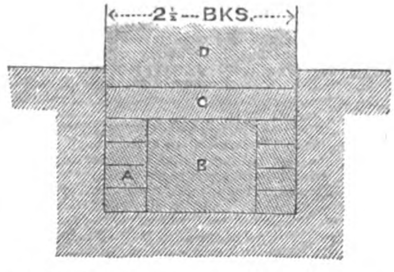
As the Town Councillors of Liverpool were assembling on Wednesday, at 11 o'clock, a man who was passing by at the moment, carrying a large jar, by some unexplained accident let it drop on the footpath. The jar was shivered, the man ran away in shame, and the Councillors, who were to consider that morning the grievances which had been made to them of the effluvium of petroleum, were disgusted with the suffocating odour which was emitted from the broken jar. It is said that the intelligence spread. The previously assembled Councillors rushed out to satisfy themselves. To judge by the sudden application of the manual digits of the Councillors to their nasal organs, the demonstration, though forcible, was anything but satisfactory; and each one was unexpectedly furnished — of course, by accident — with a practical knowledge of the scent peculiar to petroleum.

The first part of a catalogue of the Mediæval, Renaissance, and Recent Periods of works of art, on loan, at the South Kensington Museum, has just been published. J. C. Robinson, Esq., F.S.A., the superintendent of the Fine Art collections of the South Kensington Museum, is the editor, and has been ably assisted by Mr. R. H. S. Smith and the Rev. James Beck. This first part (published at one shilling) contains a catalogue of the sculptures in marble and terra cotta, &c., carvings in ivory, art bronzes, furniture, objects of ancient Irish and Anglo-Saxon art, various works of mediæval art, ecclesiastical utensils, &c., and "Henri Deux" ware. We may state that the exhibition of these works of art will be kept open to October.

In the year 1854 a scourge appeared which has several times threatened to destroy one of the great industries of France — the silk culture — which alone yields 300,000,000 fr. per ann. The Society of Acclimation of France undertook to examine the cause of this disease among the silkworms, and it appears that they have found that it is principally caused by a disease of the mulberry trees, on the leaves of which the silkworm is fed. They state that this disease can be cured by placing the infected eggs for some time in a box containing a little spirits of turpentine; but this treatment does not prevent the reappearance of the disease upon the worms when they are fed upon the leaves of diseased mulberry trees.

By using coal oil, instead of boiled tar, in preparing ropes, the risk from fire is greatly diminished.

On pulling down the extensive ruins of Messrs. Knight's soap factory, London-house Yard (destroyed by fire last year), one of the foundations was found to have been built as per sketch annexed. The wall was



A Half-back leaves. B Mould filled in.
C Stones every 3 feet. D Wall 2½ backs thick.

2½ bricks in thickness, and carried up to a height of upwards of 50ft. What would the Metropolitan Board of Works say to such *now?* First came two half-brick *leaves*, 4 courses high, filled in between with *mould*; on that, at *intervals only*, were laid small blocks of stone, partly moulded, and evidently the remains of some former building; on these, and on the mould where stone was absent, was built the massive wall that has stood so long without any sign of a settlement or of decay. The object for which this peculiar style of foundation was adopted is, of course, a mystery.

Outfit of Ships.—We have over and over again contended that the most important part of a ship's outfit rests in her pumps, although it seems hard to carry this opinion home to conviction, though facts daily recorded in our columns show that we hold no fallacious views on the subject. The most vital part of a vessel is her liability to sudden and dangerous leaks, and these calamities, as compared with others incidental to the sea, seem as six to twelve. A ship in nine cases out of a dozen may weather a gale provided she keeps free from leaks or has an efficient pump to grapple with any leak she may spring; but in ten out of twelve cases, if a vessel springs a leak at sea, and is fitted with an inefficient pump, she is sure to founder. Of the importance of efficient pumps, the presentation to Captain Boag, on Friday last, was sufficiently conclusive. The Uncas, shortly after leaving Bombay, sprang a serious leak at sea—a leak, in fact, which, had she not been furnished with a common pump, would have necessitated and warranted her abandonment. Captain Boag, however, knowing that his vessel was furnished with a pump equal to any emergency, clung to the Uncas, and brought her safely to Liverpool—in a word, the pumps saved both ship and cargo from total loss. Here is a strong illustration of the point we have long been urging, for there is little doubt had not the Uncas been furnished with Messrs. Payne & Formby's powerful pumps she would inevitably have foundered. We repeat, such a fact as the above proves that in no part of a ship's outfit is there anything of more importance than a powerful and efficient pump—one, in fact, to be relied upon in any emergency—and we think it does not require a great amount of logic to prove that by the general adoption of such a pump as Payne & Formby's (Winstanley & Kelly's patent), an immense amount of saving might be secured to the commerce of the United Kingdom.—*Liverpool Mercury.*

The prospectus has been issued of the Buenos Ayres Great Southern Railway Company. With a commanding direction, this undertaking offers great advantages for the employment of capital, as the Buenos Ayres Government guarantee 7 per cent. for forty years, while 6 per cent. will be paid during construction. The proposed capital is 750,000*l.* in 20*l.* shares. The line runs from Buenos Ayres to Chascomus, a distance of about seventy-five miles. An enormous traffic is certain, from which a large surplus over the guarantee is likely to be secured. The line will be constructed by Messrs. Peto & Betts. The grant of the railway is in perpetuity, but the Government reserve the right of purchasing it at 20 per cent. premium.

A prospectus has been issued of the Parlogwyn Tin Mining Company, with a capital of 25,000*l.*, in shares of 2*l.* 10*s.* The object is to work a mine at St. Stephen's, near St. Austell, Cornwall, which is to be purchased for 3,750*l.*, partly in shares.

A railway has been constructed in New Zealand fourteen miles in length, which rises in that distance 2,800 feet, or one foot in nineteen.

We have more than once called attention to the Inventors' Institute, and we are glad to find that it is now in working order. Sir David Brewster is the president, and the council consist of Admiral Sir Edward Belcher, vice-president; The Right Hon. the Earl of Caithness, vice-president; the Hon. Algernon Egerton, M.P., vice-president; Lord Richard Grosvenor, M.P., vice-president; General the Hon. James Lindsay, M.P., vice-president; His Grace the Duke of Manchester, vice-president; Robert Richardson, Esq., C.E., vice-president; Sir William Scott, Bart., M.P., vice-president; Sir John Villiers Shelley, Bart., M.P., vice-president; Henry Brinsley Sheridan, Esq., M.P., vice-president; Sir William Worsley, Bart., M.A., vice-president; James Jones Aston, Esq.; James Bancks, Esq.; W. H. Barlow, Esq., C.E., F.R.S.; Joseph Beattie, Esq., C.E.; Charles de Bergue, Esq.; Henry Bessemer, Esq.; The Hon. Slingsby Bethell; George H. Bovill, Esq.; Benjamin Burleigh, Esq.; John P. Clover, Esq., M.A.; Samuel Courtauld, Esq.; W. Dundas Gardiner, Esq., M.A.; James Glashier, Esq., F.R.S., F.R.A.S.; Robert Griffiths, Esq.; Dr. P. W. Latham, M.A.; J. E. MacConnell, Esq., C.E.; Walter Macfarlane, Esq.; John Milnes, Esq.; W. W. Moore, Esq.; Francis Morton, Esq.; Dr. Normandy; P. M. Parsons, Esq.; Fred. Ransome, Esq.; C. William Siemens, Esq., F.R.S.; Hume Williams, Esq. Hon. Solicitors:—Messrs. Lyne & Farington. Hon. Secretary:—R. Marsden Latham, Esq. The temporary offices of the Institution are at 26 Great George Street, Westminster.

A correspondent asks how it happens that all the shield ships on Captain Coles's principle, exhibited in the International Exhibition, have docks like the Royal Sovereign, which are now found to be wrong? He wants to know whether the Admiralty has acted unfairly, or whether Captain Coles is aware of the fact.

The *Akhbar* of Algiers announces, in its number of the 28th ult., that of the railways now in course of construction by Messrs. Peto and Betts, the section from Algiers to Blidah will be opened for traffic on the 15th inst.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

The Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

Steam Engines, &c., 153, 164, 167, 178, 202.

Boilers and their Furnaces, &c., 181, 196.

Roads and Vehicles, including railway plant and carriages, saddlery and harness, &c., 159, 182, 186.

Ships and Boats, including their fittings, 185, 205.

Cultivation of the Soil, including agricultural and horticultural implements and machines, 160, 172, 190, 191, 201.

Food and Beverages, including apparatus for preparing food for men and animals, 168, 174.

Fibrous Fabrics, including machinery for treating fibres, pulp, paper, &c., 157, 177, 197.

Buildings and Building Materials, including sewers, drain-pipes, brick and tile machines, &c. *None.*

Lighting, Heating, and Ventilating, 193, 207.

Furniture and Apparel, including household utensils, time-keepers, jewellery, musical instruments, &c., 162, 166, 169, 171, 175, 189, 195, 198, 200, 206.

Metals, including apparatus for their manufacture. *None.*

Chemistry and Photography, &c., 204.

Electrical Apparatus, &c., 161, 188, 194.

Warfare, &c., 183, 187, 192.

Letter-Press Printing, &c., 165.

Miscellaneous, 154, 155, 156, 158, 163, 170, 173, 176, 179, 180, 184, 199, 203, 208.

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153. C. Binks. *Improvements in generating steam, in superheating steam, and in apparatus employed therein.* Dated Jan. 21, 1862.

This consists in the direct application (and in the methods of effecting this application) to water for its vaporisation or conversion into steam—when such steam is to be generated in close vessels or boilers for its application as motive power and other uses—of the products of the combustion in atmospheric air of carbonaceous fuel, viz., the gaseous and volatile products of such combustion consisting chiefly of carbonic acid or carbonic oxide, or of both (according to the relative proportions used of the air and fuel) along with the nitrogen

of the air, and whilst the products are at or about the high temperature evolved on combustion. The invention also consists in heating (and in the method of effecting such heating) water for its vaporisation or conversion into steam by means of the direct application to it of the heat developed by the combustion of certain gases, when this combustion is made to take place whilst in actual contact with the water, and thereby made to impart to it directly the heat evolved in the act of combustion. Also in effecting the vaporisation of the water by the direct application to it of the heat evolved on the combination of the said gases, when such combination is made to take place separately from or out of immediate contact with the water, but whilst in proximate contact with it, and under such conditions that the products of combustion shall in their highly-heated state be applied directly to the water. Also in the use of superheated steam as the heat-giving agent for effecting the conversion of water into steam, such superheated steam being applied directly to the water to be vaporised. Also in effecting the conversion of water into steam by first producing the two gases, oxygen and hydrogen, within and from a portion of the mass of the water itself that is intended to be vaporised, and thus by effecting, whilst they are in actual or proximate contact with the water, the combustion or re-combination of such gases with the consequent reformation of water from them, and the evolution of the high temperature that follows or accompanies that combination. *Patent completed.*

154. J. Bate. *Improvements in machines for corking or stopping the mouths of bottles, jars, or any vessels requiring to be stopped up air-tight.* Dated Jan. 21, 1862.

This consists in securing a vertical metal frame to a substantial bed of wood or iron, the said frame having at the top a horizontal bearer, in the centre of which is a worm, which a screw works, and to which motion is given by a weighted lever or fly wheel being upon a centre; at the bottom of the screw is attached a movable bearer, and which rises and falls with the screw underneath, and to which are affixed the plugs which drive the corks of stoppers through gauged sockets (which are fixed in another stationary bearer) into the mouths or necks of the bottles, jars, or other vessels requiring to be stopped. *Patent abandoned.*

155. H. B. Barlow. *Improvements in machinery or apparatus for counting and indicating the number of revolutions of shafts or other articles, and for exerting power.* (A communication.) Dated Jan. 21, 1862.

This consists in various arrangements of compound differential motions for the purpose of reducing or increasing the speed of any given shaft in any given proportion, but principally for obtaining a very slow motion, and in applying the same either for the exertion of great power or for counting and indicating the number of revolutions which the shaft, moving with the greater velocity, is making in any space of time. *Patent completed.*

156. C. T. Bousfield. *Improvements in machinery for making nails and spikes.* (A communication.) Dated Jan. 21, 1862.

This relates to a novel arrangement of parts, constituting an improved nail-making machine, in which two pairs of compressing rollers are used for tapering the ends of the metal rods fed into the machine to a suitable shape for forming nails or spikes, in combination with a cutter for severing such tapered ends from the rods, and a heading die for striking up the heads of the nails or spikes while the same are held firmly between nipping dies, the object being to effect in a rapid and economical manner the conversion of rods or bars of iron or other suitable material into nails or spikes. *Patent completed.*

157. J. H. Rawlins. *Improvements in machinery used in the manufacture of paper.* (A communication.) Dated Jan. 21, 1862.

This consists in applying to a paper-making machine, wherein an endless web or woven wire is used, an apparatus consisting of a roller and travelling blanket or felt to remove the wet web of pulp from the endless web of wire of such machine. By these means the web of wet pulp is caused to adhere to the travelling blanket or felt, and the two together are pressed between pressing rollers, and then the web of pressed pulp or paper is separate from the blanket and passes away to be dried, while the travelling blanket returns to the paper-making machine. *Patent completed.*

158. A. J. Martin. *Improvements in the treatment of fusel oil, and for various applications of the same to useful purposes.* Dated Jan. 21, 1862.

The patentee claims, 1, the combination and treatment or preparation of fusil oil with pitch or other hydro-carbons as described, for the manufacture of an oil or fluid to be used for illuminating purposes. 2, treating fusil oil by subjecting it to the action of heated iron and steam as and for the purposes described. *Patent completed.*

159. R. A. Brooman. *Improvements in street and road sweeping machines, parts of which are applicable to the separation of liquid from solid substances.* (A communication.) Dated Jan. 21, 1862.

This invention consists, 1, in the employment in machines for sweeping streets and roads of two side brooms for drawing the mud and dirt into the path of the chain of brooms by which it is to be raised into a receiver. 2, in the particular construction and arrangement of the chain for carrying the brooms. 3, in the means afforded for raising the whole sweeping apparatus off the ground. 4, in the method of attaching the sweeping machine to the receiver for collecting the material swept up. 5, in the particular construction of the receiver to fit it for separating the heavy from the more liquid material swept up, so that the liquid may, in case of need, be used for watering the streets or roads. The details of the invention are voluminous.

160. W. Burgess. *Improvements in reaping and mowing machines.* Dated Jan. 21, 1862.

This refers to those machines in which the frame is supported on two wheels, and consists in dividing the second motion spindle into two parts united in a casting formed on or in a piece with the bevel wheel which drives the bevel pinion on the crank shaft or otherwise. Upon one part of the spindle the patentee keys a ratchet wheel, and fits ratchets or pauls upon arms cast on or formed in a piece with the said bevel wheel. He keys or fixes another ratchet wheel upon the other part of the spindle, and fixes ratchets or pauls upon the opposite side of the said bevel wheel to that which carries the teeth. Instead of the ratchets or pauls being fixed on and to the bevel wheel the ratchets may be fixed to it, and the ratchets or pauls may be carried on discs or projections fast on the parts of the spindle. The object of these arrangements is to allow of the machine turning without any of the working parts being stopped, for if one of the wheels travels faster than the other it turns with that portion of the spindle to which the pinion driven by it is keyed or fixed without affecting the motion of the other wheel or that part of the spindle to which the pinion driven by that wheel is keyed or fixed. By the arrangement before described the ratchet wheels and pauls are protected from dirt, and the bearings for the second motion spindle may be placed closer to the pinions driven by the main wheels than in any arrangements before proposed, and he is enabled to adopt the ordinary means for throwing the knife in and out of gear. *Patent completed.*

161. M. Henry. *Improvements in the mode of, and apparatus for, applying electricity to horology.* (A communication.) Dated Jan. 21, 1862.

This consists in regulating clocks by electricity, the clocks being so arranged and combined that they shall always gain or be a little too fast till the period of regulating them has arrived, and that when that period has come round they shall stop for a short interval to await the regulating current, which will allow them to go on again at the exact time. *Patent completed.*

163. S. Martin. *Improvements in the treatment of mineral oils, and in the apparatus connected therewith.* Dated Jan. 22, 1862.

One part of this invention, by which the patentee rectifies and deodorises the mineral oils usually called petroleum, herosine, rock oils, or oils the products of schistes or coals, peat, asphalte, or wood, consists in the use of caustic soda, mixed and agitated with the crude material, to which he subsequently adds a small quantity of tepid water. The details for carrying out this invention in all its branches are too voluminous to be quoted here. *Patent completed.*

164. J. Roberts. *Improvements in combined hydraulic motive-power engines and meters.* Dated Jan. 22, 1862.

This invention relates to the class of rotatory engines and meters where the cylinder is stationary and the piston, main shaft, and radial wings or arms rotate, the said wings or arms receiving the direct pressure of the water. The cylinder rests on framework in a horizontal position, and on the side thereof the patentee forms the inlet and outlet ports between which there is an abutment projecting inwards from the inner periphery or internal surface of the cylinder, the said ports being controlled, if desired, by slide valves or other cut-off gear. The piston is also cylindrical, but less in diameter than the stationary cylinder, and has two or more longitudinal slits or openings therein for the radial wings or arms, and a boss or other arrangement for securing it (the piston) to the main shaft, which latter rests on bearings in or near to the cylinder ends. Within and encircled by the piston and surrounding the main shaft is an eccentric-shaped cam made fast by keys or otherwise to the cylinder's end or cover. This cam, with the assistance of fitting pieces eccentric to the axis, guides the wings or arms which move through the slots in the piston over the abutment above referred to, one end or edge of the said wings or arms bearing on the cam and the other against the cylinder, the contact being maintained by springs fitted in the wings. For measuring and indicating the quantity of water or other liquid passed through the combined engine and meter, it is simply necessary to place on the main shaft or any other working part suitable for that purpose, pinions with worm wheel and multiplying arrangements of wheels and pinions, or catch and ratchet wheel, or any other apparatus for transmitting and recording motion with indices easily read, many modifications of which are well known. *Patent completed.*

165. F. W. Gerish. *Improvements in printing presses.* Dated Jan. 22, 1862.

Here the reciprocating bed or table on which the form of type is placed is caused to receive its motion from a rotatory axis or driving shaft, on which there is a crank which carries a pinion on the crank pin; the pinion rotates freely on the crank pin, and the teeth of the affixed wheel, which, by preference, is formed with internal teeth, and provision is made for the reciprocating bed or table which carries the type coming to rest at the time the impression is taken, notwithstanding the driving shaft continues its rotatory motion; and in place of the platen rising and falling to give the impression, the table with the type is lifted against a fixed stationary platen by cams. The press may be arranged to be worked by manual or other power. *Patent completed.*

166. E. Pace. *Improvements in laths for Venetian blinds, in painting such laths, and in raising and lowering Venetian blinds.* Dated Jan. 22, 1862.

The patentee claims: 1. The manufacture of laths for Venetian blinds by a slicing knife as described. 2. The construction of laths for Venetian blinds by gluing or cementing together two or more leaves or thicknesses of wood sliced or cut out of the plank as described. 3. Painting the laths by a roller or rollers in manner described. 4. Raising and lowering blinds by a roller fitted with a ferrule, in which is inserted a divided spring plug, substantially as described. *Patent completed.*

167. A. J. Beer. *Improvements in the valves of steam and other motive engines.* Dated Jan. 22, 1862.

This invention has for its object to take off or reduce the pressure upon the slide valves of steam or other engines, and thereby to reduce the friction and wear and tear of the parts. The invention consists in constructing on the valve a shallow cylinder open at both ends; outside this shallow cylinder another shallow cylinder or ring works steam tight, and is by suitable springs kept against the inside of the cover or the sustaining plate. This internal cylinder is provided with suitable packing and may be considered as an annular piston. Steam is supplied to the valve chest from the boiler, and when the induction ports are uncovered by the valve, the steam will enter the working cylinder; when the reverse action takes place, the steam will issue from the cylinder, and pass through the valve to the eduction passage. Owing to the peculiar construction of the valve there will be little or no back pressure, as the elastic force of the induction steam will be exerted against the fixed valve cover or sustaining plate, and not against the back of the valve, as is usually the case, as the back of the valve is dispensed with; the valve is mounted or secured in a band or plate to which the valve stem is secured. This latter passes through a stuffing box attached to the valve chest, and is worked in the ordinary way by eccentrics or otherwise. If two sets of valves belonging to separate cylinders are required to be worked in connection with each other, the double set of valves may be adapted to the same valve chest, which may be divided by a longitudinal partition into two compartments. This longitudinal partition of the valve chest will serve as the cover or sustaining plate for both valves *Patent completed.*

168. T. Little and J. Little. *Improvements in apparatus for cooling coffee berries.* Dated Jan. 22, 1862.

This consists of a box, case, or other suitable receptacle in which is disposed a cylinder of wire work, or other reticulated material, mounted on a horizontal axle, on which it rotates, and its diameter occupies for the most part the depth of the box, and its length the entire width thereof. The box is furnished with a suitable lid for access to the cylinder, and the cylinder has a longitudinal slide, opening, or lid at which to introduce coffee, and to empty it out of the cylinder; at the one end of the box is disposed a fan-blowing machine, which introduces a blast of cold air, while the other end of the box may be of wire work, or otherwise open for the escape of air. The cylinder has projecting ledges in the interior, so that during its rotation the coffee is continually being raised by the ledges, and allowed to fall after attaining a certain height. The cylinder is rotated by a crank handle or otherwise on its axis; this again gives motion by toothed gear to an intermediate stud wheel, from which a band imparts a multiplied motion to the fan. A drawer is disposed at the lower part of the box into which the coffee is emptied from the cylinder when cooled; it is conducted into the drawer by inclined shoots. *Patent abandoned.*

169. J. Hinks and A. Dixon. *A new apparatus for warming and drying boots, shoes, or slippers, to be called a boot-warmer; which apparatus is also applicable for racking or storing boots, shoes, or slippers, for exhibition or otherwise.* Dated Jan. 23, 1862.

This consists of a frame made of wood, iron, zinc, brass, wire, wicker or basket-work, so constructed that the boots, shoes, &c., resting upon the body of the frame shall expose their uppers to the action of the fire; the boots, &c., are retained on the frame by a bow, rod, or other means. *Patent abandoned.*

170. J. A. Mays. *Improvements in envelopes and other wrappers.* Dated Jan. 23, 1862.

To prevent the tongues or flaps of envelopes from adhering to their enclosures, the inventor proposes to apply the cementing or adhesive material to the upper surface of the edges of the flaps, instead of to the under surface thereof, and to fasten the envelope by tucking the flaps (with the adhesive material applied thereto as described) under the other parts of the envelopes, by which arrangement the adhesive matter is prevented from coming in contact with the enclosure or contents of the envelopes. For making envelopes capable of being more expeditiously opened, and to prevent their being tampered with without detection, he proposes to make at a short distance from any of the sides thereof a line or lines, or rows of perforations therein, or make to a crease or fold, or creases or folds therein, so that when it is desired to open the envelope the portion thereof beyond the said perforations or creases may be easily torn off. *Patent abandoned.*

171. J. Tomlinson. *Improvements in washing machines.* Dated Jan. 23, 1862.

This consists of a suitably shaped water-tight vessel containing two discs of wood, or other material, mounted parallel to each other on independent axles or rocking shafts, attached by connecting rods to a double-cranked driving shaft, mounted parallel to the two rocking shafts. The discs have formed on or fitted to their inner faces brushes or strips of vulcanised india-rubber, or other suitable elastic material springing therefrom at a right angle or nearer so to the inner faces thereof; or brushes and the elastic strips may be used in combination on one or both discs. The cranks or levers on the rocking shafts are constructed with rather more than twice the throw of the cranks on the revolving shaft, which cranks, being formed in opposite directions, impart to the discs reciprocating motion in opposite directions, thereby producing a rubbing action on the clothes, &c., when placed between the discs, they being surrounded with water containing soap or other detergent. *Patent abandoned.*

172. J. Wallace. *Improvements in reaping machines.* Dated Jan. 23, 1862.

The object of this invention is to improve the cutting action of the knives. These knives are a series of angular-sided blades attached to a bar, to which a reciprocating motion is imparted, this motion causing the blades to work between or through and within a series of bent back or grooved figures, which are fixed to the machine; and the invention consists in causing each knife point to traverse at least one half farther at each stroke than the distance between two adjacent fingers. This end may be obtained by various proportions of the parts, provided the proportions are made to correspond. *Patent completed.*

173. F. W. Werner. *Apparatus for the destruction of vermin.* Dated Jan. 23, 1862.

This consists of a lower part or case of circular, oval, or other form, either furnished with feet and open at the bottom, or having perforations or openings around or in the bottom for the admission of air, or having both. Upon the stand is mounted a kettle or teapot-like vessel, having instead of a movable lid a screw plug for the purpose of filling it with water or other fluid. Close to the top part of this vessel is a nozzle piece or opening into which a jet piece of a suitable shape is screwed. A lamp for burning spirits, oil, &c., is placed below the bottom of the upper vessel and lighted ready for use. The upper vessel being partially filled with water, or other vaporisable liquid, the steam or vapour generated within the vessel is projected through the tapered nozzle or jet pipe with considerable force against the object in which the vermin are secreted. *Patent abandoned.*

174. W. H. Ropes. *Improvements in machinery or apparatus for cleaning coffee, rice, or any seed or grain having an outer hull and inner pellicle.* (A communication.) Dated Jan. 23, 1862.

This applies more especially to that class of machines wherein the cleaning of the grain is effected by the attrition of one kernel or seed or grain against another in a mortar or other suitable receiver or vessel, and consists: 1. In the use of a spiral or inclined bladed propeller or propellers on an archimedian screw attached to a vertical shaft, and rotating inside the vessel containing the grain or other substance. 2. In the use of a raised step or projecting boss formed on the bottom of the vessel containing the grain immediately beneath the propeller or screw for preventing the collection or clogging of grain under the shaft or boss of the propeller. 3. In the use of one or more revolving scoops, attached to a horizontal arm or arms on the vertical shaft, for facilitating the movement of the grain towards the centre of the vessel. 4. In making the mortar either wholly or partially of stone

and with a movable bottom. Lastly, in the use of a current or currents of air for cooling and cleaning the grain. *Patent completed.*

175. H. Owen. *Improvements in the manufacture of stockings and other articles of hosiery.* Dated Jan. 23, 1862.

This refers to a previous invention patented Jan. 24, 1859 (No. 222), and which invention consisted in the introduction and construction of selvage courses or seams across articles of hosiery, so that worn portions thereof might be cut away and removed wholly or in part, leaving the remaining portion secured from ravelling by a selvage. The present invention consists in the insertion in or at the time of the manufacture of such articles of hosiery at each selvage course or seam constructed for such purposes as before mentioned, of a course of thread either of silk, flax, worsted, &c., such thread passing through the loops forming the respective seams or selvages of the main portion of the article, and of the removable pieces, and being rendered elastic by being taken up in length in its course across the "wale," so as to stretch in common with the other courses of the material composing the article to be made. The thread thus inserted, although so incorporated with the other material as to form part of the article to which it is applied, can be withdrawn therefrom without disturbing the remainder of the fabric, the worn part being separated by such withdrawal without the risk of injury to the article which would attend the operation of cutting out the injured portions. *Patent completed.*

176. G. Rogers. *Improved mechanical arrangements for letting-off water or other liquids from baths, vessels, or cisterns.* Dated Jan. 23, 1862.

This consists in substituting for the ordinary spigot and faucet tap, or other tap, used to let off liquids from butts, &c., a pipe or duct inserted into the body of the same, angled so that an ordinary short spindle drop valve may be adapted to the same within the butts, &c.; and thus, by being within the butt, &c., and at the farthermost of the letting-off duct or tap, shall insure the whole of the same being kept empty, except during the action of letting off the liquid, thus avoiding the ill effects of frost and insuring a greater facility of action. *Patent abandoned.*

177. J. C. Johnson. *Improvements in the manufacture of twist lace in twist lace machines.* Dated Jan. 23, 1862.

The patentee claims the combining and arranging the parts of a twist lace machine, so that the fancy warp threads used in conjunction with coiling warp threads are caused to move in opposite directions when making crossings, and to rest during the swing of the carriages, either from the back combs to the front combs, or *vice versâ*. *Patent completed.*

178. A. Ripley. *Improvements in the construction of pistons.* Dated Jan. 23, 1862.

This consists in a peculiar method, whereby the rings forming the metallic packing of steam pistons are caused to expand and press against the sides of the cylinder, so as to render it steam tight. The piston is composed of the usual plates having the ordinary segmental rings; on each face of the piston is an orifice passing through the plate into the interior; passing through these orifices, and working steam tight in them, are two small spindles or studs, each of which terminates in a conical wedge, or its equivalent, which, in turn, fits into and works within a corresponding hollow cone or seat; this seat is formed in two parts, and each part is attached to a segment of the ring, so that when the exterior of the piston is acted upon by the steam in the cylinder, pressure from the same cause is given to the heads of the small studs, the inner conical ends of which force asunder the parts of the hollow conical seat. These parts being attached to the segments of the packing rings cause them to expand wider and press against the sides of the cylinder. *Patent completed.*

179. H. Yates. *Improvements in machinery for bending, repairing, or renewing defective or damaged parts of iron rails.* Dated Jan. 23, 1862.

According to this invention, a suitable bed frame table or block, two dies, shaped according to the form of rail to be operated upon, are arranged, both being movable, or one being fixed and the other movable. These dies or jams are for gripping or retaining the damaged or defective portions of the rail or bar while in a highly heated state, and reducing it by pressure to its original form, as well as for holding any portion of the rail or bar while the process of welding is carried on with a view to renew any part of the surface. *Patent abandoned.*

180. J. G. Service. *Improvements in machinery or apparatus for cutting and scoring pasteboard and other similar material.* Dated Jan. 23, 1862.

Under one modification this machine consists of a pair of open-end standards, in which are arranged the bearings of a pair of rollers. Motion is communicated to the lower roller either by hand or other power, and this roller carries to and fro a table, to which a reciprocating traverse is imparted. In this table are fitted the knives for cutting the pasteboard; these knives are made adjustable as regards height by screws contained within the body of the table, so that the knives may be adjusted either for cutting or scouring. *Patent abandoned.*

181. A. W. Williamson. *Improvements in tubulous boilers or steam generators.* Dated Jan. 24, 1862.

Here the inventor combines a number of tubes or vessels by welding, brazing, or otherwise firmly joining them together, so as to form a cellular sheet or leaf, the sides of which present a corrugated surface, the tubes or passages being parallel and side by side longitudinally. They may have lateral openings connecting them together in various places along their length, and each sheet or leaf has a tube or vessel at each end, having openings made therein for connecting the tubes or cellular passages therewith. The boiler or steam generator is formed by combining together several of these tubulous or cellular sheets or leaves, with a space between each forming passages for the escape of the heated products of combustion. *Patent abandoned.*

182. J. Higgin. *Improvements in machinery for retarding and stopping railway carriages.* Dated Jan 24, 1862.

This relates to apparatus for retarding and stopping railway carriages by allowing them to descend and rest upon the skids or brakes which slide on the rails, and are held in proper position by suitable projections or flanges. The axles, wheels, bearings, and springs, as at present in use for carriages of the ordinary construction, may be used with slight modifications of some of the parts. An eccentric, or other equivalent, is used for lowering and raising the carriage, and instead of being placed immediately above the axle box, it is placed so as to act on one end of the spring, which is provided with a shoe with antifriction rollers to reduce the friction; and, if requisite, with clips taking projections on the eccentric to retain the parts in their proper positions. The lower plates for the bearings require to be made long so as to provide for the amount of lift required. In this arrangement, when the carriage is lowered to bring the skids or brakes on to the rails, the springs assume a diagonal position; and when the carriage is raised they are horizontal, as usual, each spring being joined at one end to a bracket of the usual construction. *Patent completed.*

183. J. Cornforth and B. Smith. *New or improved machinery for boring or drilling gun-barrels and tubes, and other articles having a cylindrical or prismatic figure, which said machinery may also be applied to other like articles.* Dated Jan. 24, 1862.

This invention is not described apart from the drawings. *Patent completed.*

184. W. Clark. *Improvements in the manufacture of artificial flowers, leaves, and fruit.* (A communication.) Dated Jan. 24, 1862.

The patentee claims, first, the manufacture of fruit and flowers of two tissues of a suitable nature, between which is interposed a thickness of flexible light, elastic, plastic, and resistant materials, the whole being suitably shaped and goffered, and afterwards dipped in fatty matters to give them a transparent appearance. Second, the use of a flexible and transparent matter, such as violin strings, for mounting flowers, fruit, &c., instead of the metallic wire in ordinary use. *Patent completed.*

185. J. Longhurst. *Improvements in chains and chain cables.* Dated Jan. 24, 1862.

This invention is not described apart from the drawings. *Patent completed.*

186. J. Rock. *Improvements in common road carriages.* Dated Jan. 24, 1862.

This invention consists, 1, in making a carriage with a movable, close, or coach-head, interchangeable with two half-heads, similar to those of a landau. The inventor makes the coach-head in the same way as that of the "diorópha" carriage, patented by him Nov. 9, 1850, No. 43,328; and the landau half-heads he constructs in the same way as the barouche head of the "dioropha," so far as regards the framing, strengthening, and fastening of the parts which meet and rest upon the lower body of the carriage at the elbow line. 2. In addition to the coach-head and the landau heads, he sometimes makes a third head of the kind usually made to a barouche, which head may be used in lieu of the other two; and he also makes a folding flap, or flaps, to the body, to the front seat, and doorway, also in the same way as a barouche. These barouche fittings and head may be used interchangeably with the landau heads, in cases where the carriage is not fitted with a coach-head also. 3. In some cases he uses the hinder half of the landau head in conjunction with the flap. When he so uses the half landau head, he sometimes adds a movable side piece, which may be either of panel, leather, or glass, in suitable framing, and which may be also made to turn back on hinges or joints, and serve as a wing or mud-guard. 4. In order to give more light to the interior of the landau head, he makes side lights in some or all of the four "quarters." These side lights he makes with or without detached frames, either hinged to the head or made movable, and he places them when removed in recesses formed for the purpose in the doors, or some other part of the lower body. These side lights may be of any suitable shape, and the frames may be provided with glass, venetian slats, or panelling of any kind. 5. In order to avoid the notch which usually appears in a landau head at the junction of the standing pillar when thrown open, he makes the standing pillar with a projection, and cuts away a corresponding portion of the door pillar. He then carries the pillar joint as near as possible to the inner edge of the door pillar, and he makes such pillar joint with a knuckle, the whole breadth of the pillar, and sufficiently large to allow of the groove necessary for the glass frame or blind to work in, to be filed or otherwise cut out of it, without cutting into the rivet or centre pin; or he makes the joint only of the breadth of the groove or grooves, and carries the pillar down at each side of it to form the rebates which confine the glass or blind; he strengthens these portions of the pillar, which must necessarily be thin, with metal if required. 6. This invention relates to the foundation of the various parts of carriages called transom beds, spring beds, horn bars, futchels, splinter bars, pump handles, perches, and axletree beds of plate iron or steel, cut out or forged to such shapes as, when bent to enclose or partly enclose a hollow, will form such beds and other parts of the usual or any required shape, with some parts larger than others as necessary for use as bearings and otherwise, or for symmetry. *Patent abandoned.*

187. J. W. Girdlestone. *Improvements in projectiles for fire-arms.* Dated Jan. 24, 1862.

This consists in encasing the rear portion and part of the sides of the shot or projectile with a jacket of wood, papier mâché, or other suitable material. The outside of this casing or jacket fits the bore of the gun whilst the inside fits the shot, and provision being made for enabling the jacket to detach itself readily from the shot so soon as it leaves the gun. In the case of rifled guns, the twist that is imparted to the jacket is transmitted therefrom to the projectile by a square or other suitably shaped recess in the rear of the jacket being driven over a corresponding projection on the projectile by the explosion of the charge, the projectile on loading being not quite driven home in its jacket. *Patent abandoned.*

188. T. Morris, R. Weare, and C. H. C. Moncktons. *Improvements in submarine and other telegraphic communication, and in apparatus connected therewith.* Dated Jan. 24, 1862.

This consists in the application of electric light, however generated, to the purpose of producing signals and communicating intelligence. The apparatus consists of one or more vacuum tubes or vessels of glass, or other material, or combination of materials, variously shaped and coloured or not. *Patent completed.*

189. C. G. Hall. *Improvements in the manufacture of boots, shoes, and leggings.* Dated Jan. 24, 1862.

This consists in the manufacture of boots, shoes, or leggings, or parts thereof, of horse hair, goats' hair, human, or other suitable hair, with which may be mixed silk, wool, cotton, flax, or other suitable animal or vegetable textile or fibrous material. *Patent completed.*

190. A. Wallis and C. Haslem. *Improvements in thrashing machines.* Dated Jan. 24, 1862.

This consists in a peculiar arrangement of apparatus for raising the grain from the hopper or compartment of a thrashing machine, which receives the grain from the winnowing portion of the machine to a screen or compartment of the thrashing machine, from which it is to be delivered into sacks or otherwise. For these purposes a shoot is used, the lower end of which descends into the hopper chamber, or compartment where the grain is received after being screened, and the upper end of the shoot rises to the position at or near where the grain is to be lifted to in the thrashing machine. This shoot is continually exhausted by a fan or other form of exhausting apparatus, the inventors preferring to employ for this purpose an ordinary fan, to the centre of which the upper end of the shoot is attached. The grain is continually raised by the rush of air from the outer atmosphere up the shoot to the exhausting apparatus, and it is delivered from the upper end of the shoot to a second winnowing apparatus. *Patent abandoned.*

191. J. Allison. *Improvements in apparatus for tilling land by steam power.* Dated Jan. 24, 1862.

We cannot here give space to the voluminous details of this invention. *Patent completed.*

192. W. Baker. *Improvements in fire-arms.* Dated Jan. 25, 1862.

Here the stock is provided with a sliding piece, acted on by a spring, with one end adapted to stop the trigger, whilst the other end of this sliding piece projects sufficiently through the butt and plate to be pressed inwards when the butt and plate are resting against the person holding the gun in position for firing. To prevent the effect of pressure exerted upon this sliding piece being to release the trigger, except when the trigger is also acted upon for firing at the time of the gun being held in position for that purpose, there is a supplemental stop or holder which is released by the pressure of the hand whilst pulling the trigger. The combined stops being thus simultaneously operated upon, the trigger becomes free to release the hammer. *Patent abandoned.*

193. W. Johnston. *Improvements in lamps.* Dated Jan. 25, 1862.

This relates to lamps for illuminating shop windows, halls, stations, &c., and which are of the kind comprising a variety of jets or other lights, arranged star fashion, or otherwise; and the invention comprises various improvements in forming, constructing, shaping, or arranging the details of such lamps. *Patent abandoned.*

194. C. West. *Improvements in the insulating and covering wire, and in the preparation of the materials for insulating.* Dated Jan. 25, 1862.

Here the patentee uses only the very best South American rubber, not masticated, but in its natural state. He prepares the rubber by boiling it in water, or by steaming it after it has been cut into ribbons or strips from the bottle or block after boiling or steaming it. He then allows the moisture to evaporate, until the rubber is perfectly dry, and in this state he stores it until required for use. Previously to placing the rubber on the wire, he steeps it in warm water. The rubber so prepared will then be open to the action of the solution he purposes applying to it while placing it round the wire, which solution will consist of india rubber dissolved in benzine, or any of the other solvents of india rubber, or it will consist of the solvents themselves, either in combination or singly. He places a trough over the wire, through which he allows the solution to percolate on the wire or on the rubber, just as it enters the mandril, with a receiving dish underneath, to catch such of the solution as may fall from the passing wire. After passing through the mandril the wire or rubber that is thus saturated with the solution, receives the rubber to be wound upon it from the reel or bobbin as it revolves round it, and the tension at which the rubber is placed round the wire, at each revolution of the reel or bobbin, presses the solution through the interstices of the overlapping rubber, and thus unites it into one solid tube. *Patent completed.*

195. J. C. T. Mougin. *Improvements in bercceaunettes or cradles for children or for dolls.* Dated Jan. 25, 1862.

According to this invention, the top of the basket is fixed with iron or wooden plates to the bottom, to give it greater solidity than those with nets. The basket is suspended by the middle from posts underneath the cradle, or by the top upon steel plates, or by knobs which screw according to pleasure. To this cradle a clock movement is adapted, similar to a roasting-jack, but modified and disposed to the use of the cradle. *Patent completed.*

196. J. H. Johnston. *Improvements in the prevention or removal of incrustation in or from steam generators, and in the apparatus employed therein.* (A communication.) Dated Jan. 25, 1862.

This consists in the use of a peculiar liquid, which, when introduced into the boiler, prevents incrustation therein. The liquid is composed of eight parts, by weight, of potash of commerce, or carbonate of potash, and from two to eight parts, by weight, of molasses, added to one hundred parts, by weight, of small or slug liquor. The apparatus is not described apart from the drawings. *Patent completed.*

197. D. Edleston and H. Gledhill. *Improvements in means and apparatus for finishing textile and other fabrics.* Dated Jan. 25, 1862.

This consists in the use of the flames arising from the combustion of coke or cinder-coal, wood, or other combustible matter or material, so that fabrics may be passed over, and in contact therewith, whereby the singeing of fabrics is effected with great facility, and at a considerable reduction in the cost. *Patent completed.*

198. E. A. Curley. *Certain improvements in sewing-machines.* Dated Jan. 25, 1862.

This invention is not described apart from the drawings. *Patent completed.*

199. J. Wright. *Improvements in constructing works below water.* Dated Jan. 25, 1862.

This consists in forming continuous foundations for sea and river walls, or like structures under water, by the use of cylinders or coffers, in the constructing of coffer dams. *Patent completed.*

200. F. J. L. Lefort. *Improved mechanical arrangements constituting a secret and invisible safety lock, applicable to iron safes and other depositories.* Dated Jan. 25, 1862.

According to this invention it is proposed to render the uncovering of a letter lock more difficult, by the action of the letter lock to release an ornament attached to the safe. *Patent completed.*

201. F. and A. Roberts. *Improvements in apparatus for ploughing or cultivating land.* Dated Jan. 25, 1862.

This consists partly in a carrying frame or carriage

mounted on wheels, the frame being divided into two halves, each half being occupied by a movable frame, with its set-off ploughs, trench ploughs, or other implements. At certain points the carriage is provided with toothed racks, and, at corresponding points in the movable frame, mortices are forged, which slide up and down the toothed racks. By an arrangement of spindles, pinions, worm wheels, and worms actuated by a crank handle and the toothed racks, the movable frame, with its implements, is raised or lowered, the object being to enable the ploughman to raise one set out of its work and lower the other in at the turnings, and to allow him to regulate the depth of their penetration. The movable frame is furnished with cross bars and longitudinal beams, which slide on the cross bars for regulating the width of the furrows. To guide the apparatus, a wheel is fitted or keyed on the vertical stem of the copse that carries the travelling wheels and gearing; with this wheel is a worm, fixed to the end of a short spindle, which is turned by a steering wheel, or by lengthening the spindle, the implement may be steered from the other end. At the steering end there are two wheels, the larger one is to run in the furrow, the smaller on the land. *Patent abandoned.*

202. J. Brown and J. Davenport. *An improved lubricator for pistons.* Dated Jan. 25, 1862.

This consists of a lubricator having two thoroughfares open to the steam, with a direct communication through the tap or plug, which tap or plug may be placed in a horizontal or vertical direction. *Patent completed.*

203. A. Samuelson. *Improvements in hydraulic presses and in the mode of working the same.* Dated Jan. 25, 1862.

This invention consists in a peculiar combination and arrangement of pumping apparatus for hydraulic presses, whereby the patentee is enabled to work one double press by the aid of four pumps, producing a regular and intermittent action upon the rams of the presses operated upon, and thereby gaining a considerable saving of time and labour in such process. *Patent completed.*

204. W. Smith and C. Tiesset. *Improvements in the manufacture of colours for dyeing and printing.* Dated Jan. 27, 1862.

This consists in the application of an essential or volatile oil or liquid, produced by a distillation or preparation of oily, fatty, oleaginous, or saponaceous matters to the manufacture of colours for dyeing and printing. The essential or volatile oil thus produced, when acted upon by certain chemical reagents, forms an organic basis by which the requisite colours or shades of colour are produced. *Patent abandoned.*

205. J. Lillie. *The application of new materials to the bottoms of sea-going and other vessels for the prevention of fouling.* Dated Jan. 27, 1862.

The patentee claims, 1, covering the hulls of vessels with a sheathing of non-porous and enamelled tiles, constructed and applied as described. 2, covering or coating the hulls of vessels with Japanese wax, with or without any admixture, such as chalk, applied as described. 3, covering or coating the hulls of vessels with cement and wax in combination, as described. 4, covering or coating the hulls of vessels with a species of concrete and wax in combination, as described. Lastly, the use of strychnine, arsenic, or other poisonous substances, as described. *Patent completed.*

206. S. A. Carpenter. *An improvement or improvements in covering and combining strips or bands of steel for crinoline or crinoline skirts.* Dated Jan. 27, 1862.

This consists in covering and combining a series of two or more strips or bands of steel for crinoline and crinoline skirts by a fabric, into which the bands are woven parallel to each other, the fabric also separating the strips from one another. *Patent completed.*

207. R. Martindale. *Improvements in globes and glasses to be used with hydro-carbon lamps.* Dated Jan. 27, 1862.

By this invention the breakages arising from the chimney being fixed at the base so near to the flame will be avoided. The patentee takes a globe of the common moon shape, or other suitable shape, and suspends inside it from the top a glass perdifume, or bell-mouthed tube; or it may be formed in one piece with the globe. Another form of globe which will answer well, is made by shaping the globe into a flattened spheroid, and forming a neck rising out of the top of the globe, so that the glass presents the appearance of a peculiarly shaped bottle. Several modifications are given. *Patent completed*

208. C. W. Harrison. *Improvements in printing, stamping, embossing, perforating, and other like operations, and in the machinery or apparatus employed therein.* Dated Jan. 27, 1862.

According to this invention, the operating pressure or percussive force is obtained by the adoption of electro magnetic action, so as to secure an important saving in the labour and time ordinarily required. *Patent completed.*

PROVISIONAL PROTECTIONS.

Dated March 27, 1862.

845. J. D. Schneiter, Paris, geographer. An improved method for printing letters, numbers, musical or other characters or signs on maps, plans, sheets of music paper, or other similar impressions.

Dated April 26, 1862.

1226. T. U. Brocklehurst, Macclesfield, Cheshire, silk manufacturer. Improvements in machinery for reeling singles, trams, organzines, and sewing silks.

Dated May 2, 1862.

1300. C. F. Whitworth, Yorkshire, engineer. Improvements in apparatuses for signalling upon railways.

Dated May 21, 1862.

1530. J. Hopkinson, 235 Regent Street, London, pianoforte manufacturer. Improvements in pianofortes and in the hammer rails of pianofortes.

Dated June 14, 1862.

1771. J. F. Miguel, Tours, France, doctor. An improved pessary.

Dated June 21, 1862.

1827. B. Fabbricotti, 150 Leadenhall Street. A polishing and grinding belt, formed of leather or other flexible or pliable material, having plugs composed of emery or other gritty substance, and a proper cement inserted in it substantially. (A communication.)

Dated July 4, 1862.

1948. J. Howard and J. Bullough, Accrington, Lancashire, iron founders. Improvements in warping and beaming machines.

Dated July 5, 1862.

1954. P. B. O'Neill, Warwick Street, Regent Street, gentleman. Improvements in screw wrenches or spanners.

Dated July 7, 1862.

1955. J. Kidd, Cannon Row, Westminster, engineer. Improvements in gas meters.

Dated July 10, 1862.

1984. E. Jaudeau, 1 Guildford Road, Brighton. An improved method of, and apparatus for, removing the bad flavour from alcohols distilled from grain, beetroot, of other vegetables, and for extracting the whole of the alcohol contained in the fermented juice.

1988. J. Ponti, Venice, Austria. An improved apparatus for viewing photographic pictures, and the preparation of photographic pictures to be used in such apparatus. (A communication.)

Dated July 12, 1862.

2004. J. Abraham, Birmingham, machinist. Improvements in presses for raising or shaping metals.

Dated July 14, 1862.

2018. A. A. Gannal, Paris. Certain improvements in the manufacture of bituminous cement.

Dated July 16, 1862.

2042. R. Dunn. Improvements in furnaces for steam boilers and other purposes.

Dated July 17, 1862.

2044. J. Dickson, 66 Tollington Road, Holloway, Middlesex, gentleman. Improvements in the manufacture of caustic soda and carbonate of soda.

Dated July 18, 1862.

2054. J. R. Abbott, Birmingham, lamp manufacturer. Improvements in sliding chandeliers, gaseliers, and other pendent lamps.

Dated July 19, 1862.

2060. R. Barrett, Stepney, Middlesex, engineer. Improvements in apparatus for working the damper of steam-engine furnaces.

2062. A. Cotelle, France, distiller. Improvements in the manufacture of alcohol.

2064. W. E. Newton, Chancery Lane, Middlesex, civil engineer. Improvements in ordnance and projectiles for the same. (A communication.)

2066. T. H. Saunders, Phœnix Mills, Dartford, Kent, paper manufacturer, and J. Millbourn, manager. Improvements in the manufacture of paper.

Dated July 21, 1862.

2068. C. Ramsay, New Bond Street, Middlesex. An improved military cloak.

2072. T. Davey, Tuckingmill, Cornwall, gunpowder manufacturer. Improvements in the manufacture of gunpowder and explosive compounds.

2076. A. Phillips, Glasgow. Improvements in looms for weaving figured fabrics.

Dated July 22, 1862.

2078. S. Lord, machinist, and J. Lord, manager, Facit, near Rochdale. Improvements in carding engines.

2082. J. Daniels, Leigh, Lancashire, manure manufacturer. Certain improvements in artificial manure.

2084. W. E. Gedge, Wellington Street, Strand, Middlesex. An improved instrument for marking wadded or other stuffs. (A communication.)

2086. H. R. Summons, Navarino Terrace, Dalston Road, Middlesex. An improved apparatus for bordering envelopes, paper, and cards.

2088. T. King, Truman's Brewery, Spitalfields, Middlesex. Improvements in apparatus for measuring malt, grain, and other granular substances.

2090. J. H. Johnson, Lincoln's Inn Fields, Middlesex. Improvements in the treatment of the noxious gases or vapours produced in the distillation or purification of tar. (A communication.)

Dated July 23, 1862.

2094. Z. Colburn, Tavistock Street, Bedford Square, Middlesex, mechanical engineer. Improvements in apparatus for the condensation of steam in steam engines.

2098. E. Alcan, Coleman Street Buildings, London, merchant. Improvements in machines for combing and carding wool and other filamentous materials. (A communication.)

Dated July 24, 1862.

2102. J. Horton, New York, America. Improvements in breech-loading fire-arms.

2104. H. Rawson, Leicester, manufacturer, and F. Staples, Leicester, mechanic. Improvements in machinery for combing wool and other fibres.

2106. J. G. Clarke, Brackley, Northamptonshire. Improvements in scythes.

2108. W. Clark, Chancery Lane, Middlesex. Improvements in machinery for the manufacture of fishing and other nets. (A communication.)

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2144. R. Thompson, Boston, America. A new and useful improvement in lockstitch sewing machines.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

775. A. Hill. Fastening for stays.
787. J. Fawcett. Scouring, cleansing, and fulling of woollen or other cloths.
804. T. F. Hale. Valves.
812. C. M. Roullier. Flat cables or chains.
814. J. Topham. Preventing incrustation in steam boilers.
816. W. Henson. Knitting machinery.
821. W. Beaumont. Sights for rifles.
831. J. H. Johnson. Apparatus for cleaning tubes and flues of steam boilers. (A communication.)
835. H. Nunn. Mangles.
848. R. Edwards. Machinery and apparatus for pulverising, stamping, and washing mineral, animal, and vegetable substances.
852. J. L. H. Clémence and V. de Corneillan, Comtesse de. Treating open cocoons, and converting the waste resulting therefrom into paper.
854. R. de Bary. Manufacture of cigars. (A communication.)
859. W. F. Smith and A. Coventry. Lathes and machines for turning and cutting screws.
860. G. H. Birkbeck. Producing imitation mosaics. (A communication.)
864. W. B. Nation. Manufacture of boxes.
865. R. A. Owen. Screw propellers.
875. I. Morris. Cultivating land.
880. W. Paterson. Manufacture of iodine.
882. J. Baker. Improved alimentary preparations.
884. J. Platt and W. Richardson. Carding engines.
892. W. H. Hook. Folding envelopes and paper.
906. P. R. Couchoud. Manufacturing chenille and other lace-work.
907. C. P. Gontard. Stopping piece for watches.
915. H. W. Caslon and G. Fagg. Casting printing types.
921. H. Lorenz and T. Vette. Filters.
925. S. Warren. Transmitting motion.
937. G. Rebour. Autographic log.
941. J. Newton. Construction of breakwaters, piers, and sea walls.
942. G. Hunter. For cutting, sawing, and planing stone, marble, and slate.
950. H. T. Hassall and M. Burke. Invalids' chairs.
982. W. Simons. Constructing ships or vessels.
987. T. Jackson. Pianofortes.
1019. R. Theyson. Cork-cutting machinery.
1044. J. F. Mathias. Pressing and ironing straw hats.
1052. J. Howard, E. T. Bousfield, and T. Phillips. Steam cultivation.
1218. A. C. Kirk. Refrigerating apparatus.
1237. A. Lester. Manufacture of the fronts or uppers of slippers, shoes, boots, and gaiters.
1646. J. Betteley. Ship building.
1668. J. J. H. Gebhardt. Fastening for bags. (A communication.)
1767. J. Lancelott. Manufacture of ornamental chains.
1833. J. Anderton. Tape-leg or sizing machine.
1890. I. Holden. Preparing and combing fibrous materials.
1952. C. G. Hill and W. Jackson. Producing ornamental patterns or figures on lace.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed August 1, 1862.

289. T. M. Meekins.
315. P. H. Astley and C. Leighton.
347. W. Clark.
366. J. Robb.
1283. H. F. Broadwood.
1334. J. Victor and W. Rounsevell.
1371. W. Gossage.
1380. P. Tate.
1450. C. T. Porter.
1664. W. E. Newton.
1666. A. V. Newton.
1690. A. V. Newton.

Sealed August 5, 1862.

322. R. A. Brooman.
324. P. Shaw.
325. H. A. Silver.
335. F. Tolhausen.
337. J. Carrington.
340. J. Dickson.
345. G. Smith.
351. T. Fyfe.
359. R. Johnson.
360. G. Lindemann.
362. F. J. Bolton.
363. J. Hetherington.
374. T. Horsley.
384. T. Davison.
389. G. C. Burrows.
393. J. E. M'Connell.
447. G. T. Bousfield.
460. R. H. Skellern.
463. W. Hamer.
492. T. N. Kirkham and V. F. Ensom.
511. W. M'I. Cranston.
539. T. Bray.
550. J. L. Charcouchet.
565. S. G. Reynolds.
843. J. Haworth.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1766. F. Haeck.
1770. H. J. Newcome.
1768. A. B. Scithen.
126. H. Medlock.

PATENTS ON WHICH THE SEVENTH YEAR'S STAMP DUTY HAS BEEN PAID.

1747. E. Hunt and H. D. Pochin.
97. C. A. Girard.

LIST OF SPECIFICATIONS PUBLISHED.

During the Week ending August 2, 1862.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s. d.		s. d.		s. d.		s. d.		s. d		s. d.
3213	0 4	3224	0 4	3235	0 10	3246	0 10	3257	0 8	3268	0 8
3214	0 10	3225	0 4	3236	0 4	3247	0 4	3258	3 0	3269	1 8
3215	0 10	3226	1 4	3237	0 10	3248	0 4	3259	0 4	3270	1 0
3216	0 6	3227	0 10	3238	0 8	3249	1 10	3260	0 4	3271	0 10
3217	0 8	3228	0 10	3239	1 0	3250	0 4	3261	0 4	3272	0 4
3218	0 8	3229	0 8	3240	0 10	3251	0 8	3262	0 4	3273	0 4
3219	0 4	3230	0 6	3241	0 8	3252	0 8	3263	0 10	3274	0 8
3220	0 8	3231	0 4	3242	0 10	3253	0 4	3264	0 6	3275	1 2
3221	0 8	3232	0 4	3243	0 6	3254	0 4	3265	0 4	3276	0 10
3222	1 4	3233	0 4	3244	0 4	3255	0 4	3266	0 4	...	...
3223	0 8	3234	0 10	3245	0 8	3256	0 10	3267	0 6	...	...

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, AUGUST 15, 1862.

METROPOLITAN IMPROVEMENTS.

Having recently given a detailed description of the Metropolitan Main Drainage Works, we shall now give only a brief analysis of their nature, object, and extent. This great scheme consists of the construction of three main sewers on each side of the Thames, running east and west, and intercepting the sewage, which is conveyed by the present system in mains running north and south, and flows into the Thames. The entire drainage of the metropolis and of the immense area combined with it, instead of falling into and polluting the river, will be carried through the new mains along the banks of the Thames, and deposited in reservoirs thirteen miles below London. Here the sewage will be deodorised and discharged into the river at a proper height and flow of the tide for carrying it out to sea, and rendering the return of any portion of it back to the metropolis an impossibility. When the works are completed, the ebb and flow between the bridges of 300,000 gallons of putrescent fluid, which now daily contaminate the stream, will cease, and the once silvery Thames will be restored to its purity. The other evils of the present system will be removed. The miasma from the stagnation of sewage in the drains, engendering disease of the most virulent character, and the periodical flooding of low-lying districts by the mains being tide-locked, will altogether cease, and the health and cleanliness of the metropolis will be greatly increased. A few figures will give us an idea of the vast magnitude of the undertaking. The three gigantic main sewers on each side of the river will form a total length of fifty miles. The underground tunnels, which will extend from London to Barking on the north and to Erith on the south side, will be 9ft. and 10ft. in diameter, and are calculated for the conveyance of twice the amount of the present drainage. The main sewers are of three classes — high, middle, and low level — corresponding to the levels of the districts to be drained. At a little distance below London the sewage will be lifted from the lower to the higher level on each side of the river by 8 pumps of 7ft. diameter and 4ft. stroke, with engines of 500 horse-power, which will each daily raise 19,000,000 cubic feet of sewage from 19ft. below low water to the high level ducts, and will be capable of raising 25,000,000 cubic feet per day. From these ducts the sewage will descend on the north side by 3 tunnels, each 9ft. 6in. in diameter, and nearly 4 miles long, and on the south side by one tunnel 10ft. in diameter to the depositing reservoirs, which will cover 14 acres on the north and 5 acres on the south side. One continuous tunnel, which will pass under Woolwich, will be 1½ miles in length, and 80ft. under the surface of the ground. On the north side the high level main is completed and at work, the middle level is in a forward state, and Mr. Bazalgette, the engineer of the Board of Works, calculates that in a year and a half from this time all the main sewers will be constructed. Before all the works are completed, 800,000 yards of concrete and upwards of 300 millions of bricks will be used, and 4,000,000 cubic yards of earth will be removed. A plan is organised for the formation of a company to utilise the sewage as liquid manure on a large scale, so that the question as to its value will be determined.

The total cost of this grand work is estimated at 4,000,000*l.* sterling; and, before its completion, with the supplementary works, which it cannot fail to call into existence, will probably be increased to 6,000,000*l.* What an idea does not this give of the magnitude, grandeur, and wealth of a city which expends such vast sums on underground works for the comfort and health of its inhabitants!

The Metropolitan Subterranean Railway Works were inspected last week by a party of the directors and other gentlemen interested in the undertaking, who passed through the entire length of the line from the junction at Paddington to within a few yards of the temporary station at Farringdon Street. The inspection commenced at the terminal station at Paddington, the construction of which is a difficult piece of work, arising from the confined and awkward nature of the ground on which the station has to be fitted on either side of the up and down lines of the metropolitan branch. At this point an artificial roadway is carried on girders to give room for a standing, and for an approach for cabs and omnibuses. The engine used on Monday was especially designed for the line by Mr. Fowler, the engineer of the company. It consumes its own smoke and condenses its own steam, and gives off neither smoke nor vapour when it once enters the tunnel. The carriages are lighted with gas on a simple and efficacious plan. In an india-rubber bag, on the roof of each carriage, the gas is enclosed, and feeds two lamps for two or three hours. This arrangement has been at work for some time on many of our northern lines and on the continent, and has always worked with safety. When empty, the bags are replenished in a few moments from an ordinary gas-stand pipe. The train proceeded at the rate of about twelve miles an hour — a speed that was seldom exceeded, from the constant stoppages to visit all the stations. The tunnel was perfectly clear, free from close air, dry, and well lit. The directors were perfectly satisfied with the result of their inspection. The line, it is reported, will be open for traffic on the 1st of October.

The Report of the Commission for the Embankment of the Surrey Side of the Thames has lately been published. The commissioners were appointed to examine plans for embanking the Surrey side of the river within the metropolis, and to report which of the plans will conduce with the greatest efficacy and economy to the improvement, embellishment, and convenience of that part of the metropolis, improve the navigation of the river, and provide a public thoroughfare without stopping such trade as must be carried on upon the bank of the river, and also upon the cost and means of carrying the same into execution. Responding to an advertisement, twenty designs were submitted to the commissioners for examination, and a short description of each is appended to the report. The excellence of many of these plans, which embrace the banks of the Thames from Deptford to Battersea Park, is admitted; no one of them is recommended for adoption in its entirety, but the principal features of some are embodied in the scheme proposed by the commissioners. The proposals comprised three sections, namely, Deptford to Westminster Bridge, Westminster Bridge to Vauxhall Bridge, and thence to Battersea Park. The commissioners are of opinion there is no necessity for a public road from Deptford to Westminster Bridge. It would, they say, cause a vast expenditure of money, and great disturbance of the trade on the south side of the metropolis. They foresee, however, that the owners and occupiers of wharfs may wish to carry out a plan of embankment, and they recommend that every facility should be afforded for securing uniformity of design and navigation in the execution of the works, but not at the public expense.

In executing the second section, from Westminster Bridge to Vauxhall, a great improvement would be effected by an embankment and railway between those points. The frequent flooding of the low grounds on the Surrey side, which are the source of great distress and sickness, affecting the poorer classes, would be prevented, and that part of the metropolis would be greatly embellished. The third section, between Vauxhall Bridge and Battersea Park, is strongly recommended. An embanked roadway would afford access to the Battersea station of the South Coast Railway and to the goods station of the South-Western and Chatham and Dover Railway, would improve and embellish that part of the metropolis, and afford a convenient and agreeable approach to Battersea Park. The report proposes that an embanked roadway of about two miles in length should be formed from Westminster Bridge to Battersea Park, on a viaduct of ornamental character, opposite the Houses of Parliament as far as Bishops' Walk, and thence on a solid embankment to the new Suspension Bridge at Battersea. Dredging the fore-shore to a level of five feet below low water will improve the navigation, and the nature of the works would prevent the accumulation of mud. The estimated cost of the works, including land and compensation, is 1,000,000*l.* If the present opportunity is not embraced at once, the cost will be much greater, by reason of the increasing demand for land and houses. To meet the expense, the coal and wine dues would have to be appropriated for a *further period.*

The third great iron bridge, carrying the Charing Cross line over the Southwark Bridge Road, was commenced last week. Those over Stamford Street and Blackfriars Road are successfully completed. The works and foundations for that over the Borough to London Bridge are also progressing.

In connection with the approaches to the permanent Crystal Palace Exhibition at Paris, it is announced in the *Moniteur* that the foundation works of the bridges across the Seine between the Pont de Genalle and the Pont de Sevres have commenced. These bridges, of which several have been already built, are on the system of the engineer, M. Legrand, of which the merit is facility of construction and economy of expense. The bridge is formed of two massive girders, extending from shore to shore, which are twelve mètres apart, and tied together by means of a system of rigid lattice-work, supporting a platform of cast-iron plates, on which the roadway is laid. The iron-work will be fitted together piece by piece on the surface of the abutment pier on the right bank, and will be pushed forwards on to the supporting cylinders in the river gradually as the fitting of the iron-work progresses. This plan has been successfully practised with several iron bridges and viaducts, thereby avoiding the inconvenience of scaffoldings, which are indispensable in other systems of fixed bridges.

In Class No. 10 of the International Exhibition is exhibited a model of Mr. Asprey's plan for connecting the railways on both sides of the Thames, and relieving London Bridge of the traffic to and from the different railway stations. This plan embraces a line of railway

from the London Bridge to the Fenchurch Street station, crossing the Thames on the east side of London Bridge, with a branch on the south side to the Charing Cross Railway. The advantages of the plan are, that the through traffic would not require a change of carriages; passengers would be conveyed direct from the South-Eastern and South-Western and West End Railway direct to the city, and right through to the Blackwall and other lines in connection, and London Bridge would be relieved of an immense amount of traffic.

THE COINAGE OF 1861.

As some very meagre and incomplete statements have gone the round of the general newspapers, in reference to the quantity of coin of each denomination issued from the Royal Mint in the year 1861, we deem it proper to furnish a more exact account of the doings of that establishment during the period named. It is important that the public should be correctly informed as to the state of the metallic currency of the United Kingdom, and the extent to which it is increased or diminished in each year. The official returns for 1861 have only recently made their appearance, although we know of no reason why they should not have been published many months ago. From those returns we gather that in the past year there was forwarded from the Bank of England to the Mint, for the purpose of conversion into sovereigns, 1,922,988,584 ounces of standard gold, and this yielded 7,487,636*l.* sterling. The quantity of standard gold imported from the same place for conversion into half-sovereigns was 145,215,788 oz., and this produced 1,130,867 coins of that denomination, or 565,433*l.* sterling. The total value of the gold coinage for the year 1861 amounted, therefore, to 8,053,069*l.* sterling. We believe that we shall be violating no rule or regulation of the Mint if we state further that, in the numerous processes employed at that place for the purpose of transforming the Bank ingots into current coin, *no loss* of metal whatever was sustained, either by waste, punctation, or any other cause. The importance of this statement, the accuracy of which we guarantee, will be appreciated by our readers, especially when it is remembered that the weight of those ingots was over 80 tons. It is, indeed, but an act of simple justice to Mr. Graham, master-worker of the Mint, and his staff of officers and men, to make this fact known. It is questionable whether, in any other money manufactory in the world, the same extent of accuracy has been attained. Prior to the year 1856, when the present Master of the Royal Mint made considerable changes in the executive department of the Tower Hill establishment, a very different state of things obtained. It was then no uncommon thing for the "working losses" of the Mint to be set down at 700*l.* upon each million sterling of gold coined there. Surely it cannot but be interesting to the public, who were called upon to make good the deficiencies, to learn that the words "working loss" are now positively unknown at the Mint, and that it returns to the Bank, weight for weight, in gold coins just what it receives in ingots.

Turning now to the silver coinage of the year 1861, we find that there were struck at the Mint presses between Jan. 1 and Dec. 31, of florins 839,520, representing a value of 83,952*l.*; of shillings 1,382,040, or in value 69,102*l.*; of sixpences 601,920, of the value of 15,048*l.*; of threepences there were struck, in the same period, the enormous number of 3,299,208, or in value 41,240*l.* worth. Besides these there were coined at the Mint in 1861 what are known as the Maunday monies of the year, consisting of silver pieces of the respective value of 4*d.*, 3*d.*, 2*d.*, and 1*d.* each, and amounting in aggregate value to 198*l.* We omit the account of sundry colonial coinages of silver, &c., which were conducted at the Mint, and state that the total value of the silver coinage for Great Britain during the year in question was 209,484*l.* The amount of worn silver coin purchased, at its nominal value, from the Bank of England for re-coinage was 97,600*l.* The Mint value of this, at 5*s.* 6*d.* per ounce, however, was only 84,940*l.* 1*s.* 10*d.*, so that a loss occurred by the transaction to the extent of 12,659*l.* 18*s.* 2*d.* This loss, resulting from the abrasion of the coinage in the wear and tear of circulation, has to be borne by the public treasury; and it is a singular fact, and one speaking eloquently of the commercial activity of our time, that every year it increases in extent. Sixpences especially are short-lived. They do an enormous amount of duty in a very little time, and are therefore soon worn out. It would be curious to learn the value and the variety of materials which each smooth-faced sixpence has purchased in its passage through the channels of circulation—in its journeyings from the Mint press to the time of its return to the Mint crucible. It is unfortunate that the smooth-faced coin has not a tongue to tell its own story. Certain it is that that story would be a strange one, and perhaps more thrilling than any penned by Charles Dickens or Wilkie Collins! Another question in reference to the loss sustained by the Mint in its purchase of old coin for re-coinage is, What has become of the 12,659*l.* 18*s.* 2*d.* worth of silver abraded from the surfaces of the used-up pieces of money? It exists somewhere, unquestionably. Perhaps some very enterprising gentleman may take a hint from the query, and organise a Company (limited) for the "recovery of the particles of gold and "silver annually lost in the circulation of our "metallic currency." We *have* heard of schemes not *more* likely to pay than this, and possibly there may be some afoot, even now, which have not so good a chance of success.

Let us return, however, to the realms of fact, and leave those of speculation, into which the loss of money led us. We have seen what was effected at the Royal Mint in the shape of gold and silver coinages during the year 1861, and it would be unjust not to note also its dealings with the humbler, but very useful, coinage of bronze. We find, then, that the Mint, assisted largely by contractors at Birmingham—Messrs. James Watt & Company—produced in 1861, of bronze pence 36,449,280, or in value 151,872*l.*, and in weight 339 tons; of halfpence 54,118,400, in value 112,746*l.* 13*s.* 4*d.*, and in weight 302 tons. Of farthings, which appear to be more and more disliked, and disused by the public, there were struck only 8,601,600, representing in value 8,960*l.*, and weighing 24 tons. The total value of the bronze coinage executed at Tower Hill, London, and Soho, Birmingham, during the year of grace referred to, was 273,578*l.* 13*s.* 4*d.*, and its weight, 665 tons. The cost of the copper and other materials, in the shape of old coins and new metal, for the purposes of the bronze coinage, was 96,735*l.* 6*s.* 8*d.* By comparing this last sum with the nominal value of the pence, halfpence, and farthings, coined and issued, the amount of profit accruing to the public exchequer in the transition from heavy copper to light bronze coins will become strikingly apparent.

It may be stated, finally, that no crowns, half-crowns, nor fourpenny pieces, except the Maunday groats, were struck in 1861, and that the whole series are fast becoming obsolete.

AN EFFICIENT IRON-CLAD FLEET.

Our iron-clad Navy has become, as we long ago predicted it would, the paramount national question. Even after the close of the session, in which it engrossed a larger share of public attention than any other, and gave rise to the most animated debates in both Houses of Parliament, the subject has retained its vitality, and promises to be kept in a permanent state of agitation until a satisfactory solution of the disputed theories it involves is arrived at. Nor is it to be wondered at that this great question should excite the most earnest controversy. Its immense importance is felt throughout the country; and whether we consider it with reference to the national defences or the naval expenditure, it cannot cease to command the public interest.

The Parliamentary debates left the whole question of our coast and harbour defences in a state of uncertainty. The dogged determination of Lord Palmerston to carry out his scheme of inland fortifications, which is a perfect mania, overrode every other consideration, even to the sacrifice of his darling object—namely, protection of the country against foreign aggression—which he would have us believe is, and has been, the cherished motive of his public life. On the Spithead Forts motion his administration suffered a complete and decisive defeat, and there is not a shadow of doubt that his National Defences Bill would have been thrown out, and his tenure of office brought to a sudden termination, if he had not made it a party question by threatening a dissolution if his adherents did not support him. They yielded, and sacrificed the national interest. We do not make these remarks in any party spirit, because we keep aloof from party; but when a party manœuvre, or a party weakness, to use the mildest term, imperils the national safety and wastes the public money in a department which comes within the scope of the supervision of this journal, we should fail in our duty did we not speak out plainly.

We are grieved that Parliament separated without imposing upon the Admiralty any definite conditions for the construction of an iron-clad fleet. What that department is required to do, or intends to do, is left in absolute and perplexing doubt. We have still ringing in our ears the parting and ominous words of the Earl of Ellenborough: "If "England do not possess an iron-clad navy "larger and more efficient than the navy of "other maritime states, she will lose her su-"premacy at sea; and if she lose the supre-"macy at sea, she will cease to be a first-class "power."

The Duke of Somerset heard these words, and his strong good sense must convince him of their truth; and yet how is it that he allows himself to be entangled in the routine and traditions of the Admiralty, the euphemisms for the gross maladministration of that department, to such an extent as to become the slave of the Controller of the Navy? On no other hypothesis can the dereliction or compromise of duty of the First Lord of the Admiralty be accounted for. In this state of things it is not surprising that the bitter animosities of Parliamentary discussion on the much-vexed question, and the measures of the

Admiralty for the construction of armour-plated men-of-war, should at an early day after the prorogation find representatives and advocates or opponents in the press.

Two champions from the opposite camps have taken the field. Mr. Scott Russell has opened a violent and direct attack on the Admiralty, making the Duke of Somerset personally accountable for its alleged delinquencies, and Mr. E. J. Reed comes forward in defence of that department. The columns of the *Times* are the arena of the combatants, and the editor of that journal has taken a part in the conflict, which is assuming the aspect of a "pretty quarrel" of that warm character which usually reveals the truth to lookers-on. The *Times* appears uneasy about its patrons, or *protégés*—we do not know which to call them—at the Admiralty, and in a temporising article steps in as mediator, admitting there is much truth on both sides of the question. Without partiality or prejudice for either side, we will endeavour to place the matter in dispute in the right point of view.

Mr. Scott Russell charges the Admiralty with waste in having expended twelve millions during the last three years, and produced only two vessels, the Warrior and the Black Prince, of that efficient armour-plated class which he contends alone are of any avail, as a part of our fleet in the present state of naval warfare. Except for the construction of these two ships, costing about a million, he says the remainder of the twelve millions has been wasted on wooden screw steamers, which when they were built were known to be out of date, and on the Valiant and Resistance class of iron-clad vessels, which he pronounces to be "tubs," and of no use for actual naval warfare. He then reviews the Admiralty statements of iron-clad ships under construction, and, from their own admission, shows that these will not be completed till 1864, by which time 8,000,000*l.* more will have been expended, making with the previous expenditure of 12,000,000, a total of 20,000,000*l.*, for which he says we shall have, supposing the Admiralty's anticipations to be realised, four more Warriors, which he values at 2,000,000*l.*, and nine other vessels of a heterogeneous character, including four iron tubs and five wooden ships, iron-cased, all of which he considers dear at 3,000,000*l.* He then completes his sum, and, charging the Admiralty with 20,000,000*l.*, he credits them with 6,000,000*l.* value received. This is the form and the gravamen of the accusation of waste, and in a financial and administrative point of view the indictment is a serious one. But to our mind this arithmetical calculation, founded on assumed and uncertain data, is a loose and unsatisfactory mode of treating a vital national question; and it is a kind of attack which may be met, if not rebuked, with a change in the figures and denominations calculated to puzzle the assailant and mystify the public. This precisely is the tack taken by the *Times*; and we do not consider Mr. Scott Russell's assault upon the Admiralty either judicious or fortunate. He has generalised and assumed so much, and so mixed up the obscure past, comprising three administrations, and the hazy future of more than two years, that he has done nothing to elucidate the present or advance the cause he has taken in hand. The mode of attack for attaining the object in view, which essentially is the prompt construction of an effective iron-clad navy, is not to cry over spoilt milk, and tax the Duke of Somerset with the delinquencies of his predecessors, or to enter into forced or fanciful estimates to establish a great waste, but to assail the Admiralty for its present shortcomings and provoke a categorical explanation of its intentions.

Mr. Reed is adroit enough to perceive the weakness of the attack, and he assists to deepen the mystification in which his adversary unwittingly envelopes the mal-administration and self-willed persistence of the Admiralty in their slavish dependence on the Controller's department. Of this department Mr. Reed is an employé, and he naturally labours *con amore* in its defence; but he is also, as it is well known, the inventor of that combination of wooden bottoms and iron-top sides which has been eagerly adopted by the Controller of the Navy as a compromise, enabling him to continue the construction of wooden vessels in spite of the adverse opinion of the most eminent ship-builders and engineers, and in direct opposition to the pledge given by ministers to the House of Commons, that no more wooden vessels would be built.

In this controversy between two naval architects, the real question is frittered away in the discussion of technical and financial points, and in supporting the particulars, plans, or modes of construction of which each claims to be the inventor or promoter. Mr. Scott Russell is all for speed and power combined, which he imagines are to be attained by fine lines and immense length in iron-built ships, of which in his mind the Warrior is the "beau-ideal." Mr. Reed is also the advocate for speed, not only for the colossal Warriors and Northumberlands, which, as the offspring of the Controller's office, he will not disparage, but for cruisers in all parts of the world where England must hold the command of the seas and protect her commerce and dependencies. In his own explanatory statement, when the design of the Enterprise was somewhat rudely assailed, Mr. Reed deliberately admitted that to be his object, and he avowed that to attain speed, combined with partial protection and diminished draught, "wooden bottoms" were his universal panacea.

We would guard the public against being misled by the professional squabbles of rival constructors, or by the blunder and pretence of raising an issue on "Admiralty Waste," as these discussions, at the present critical moment, divert attention from the vital question of the total inefficiency of the Admiralty organisation for constructing such an iron-clad fleet as shall maintain our supremacy at sea, with the loss of which we are threatened.

The revolution in naval warfare is an established fact. In a series of articles we laboured for some time in impressing that fact on the public mind, and we believe not unsuccessfully. We raised the question of "power or "speed for the navy?" and the position we took (under the new phrase of invulnerable iron walls for ships' sides), that *power* is the primary condition, has not been refuted. Now, if this position be true, we can at a breath blow away the chaff and exhibit the grain of the Russell and Reed controversy, and disconcert the tortuous policy of the Admiralty press in agitating points of secondary importance as if they were the main issue.

What England wants, and what England is prepared to pay for, is an efficient iron-clad fleet, comprising vessels of all the classes required for the different services; and, to clear away the ground, we will at once say, neither the much-prized Warriors of the Admiralty and Mr. Scott Russell, nor the timber-bottomed Enterprises of Mr. E. J. Reed, are worthy of serving as types of either the required classes. The Warrior is unprotected at both ends, and, therefore, might be disabled by a few broadsides; she steers and rolls awfully, leaks through the joints of her armour like a sieve, and, worst of all, she is armour-plated in so defective a manner that, by the admission of the First Lord of the Admiralty, and from the result of the experiments at Shoeburyness, the through bolts which form the fastenings are liable to be destroyed by a few discharges of shot, and the plates to fall bodily off the side of the ship. As to the Enterprise, it would be a waste of time to repeat the objections to a system of construction which sacrifices power to speed, and produces a partially-protected wooden vessel, which would be as speedily crushed in an encounter with a completely iron-clad ship as a whole fleet of Federal half-clad gun-boats has lately been put *hors de combat* by a single Confederate iron monster.

We adhere to the theory deliberately adopted and promulgated in the "Magazine," that, with the altered construction of war ships, invulnerability is the first consideration. Speed, of necessity, becomes a secondary one, because the two conditions, however desirable, cannot, in the nature of things, be combined in the same vessel. By power, we mean defensive as well as aggressive power; and the two united demand a maximum weight of iron armour and guns which renders the combination of the greatest power and the greatest speed in the same vessel an impracticable and visionary scheme.

Mr. Reed having recourse to the small weapon of verbal criticism, makes Mr. Scott Russell say what he did not say, namely, that the Admiralty are building no iron-cased "fleet at all." Mr. Scott Russell's statements are, not that no fleet at all is being built, but—

1. That we have no fleet at present, and the two Warriors and two Defences cannot be said to constitute a fleet.

2. That the vessels launched, and those under construction, will form an *inefficient* fleet.

3. That we must wait until some indefinite period in 1864 before even this inefficient fleet will be in existence.

It is hardly fair in Mr. Reed thus to misrepresent Mr. Russell's obvious meaning, and hardly prudent, as a public servant, to publish a long letter of which that misrepresentation is the burthen. We are not going to mix ourselves up with the personalities in which both writers have indulged; but we fear it will be thought by many readers that Mr. Reed, in his remarks on Sir Morton Peto and Mr. Russell, has not displayed good taste, and is himself not free from the "poor spirit" of which he complains in them.

Resuming the subject of "an efficient iron-"clad fleet," there can, we think, be no doubt that it must be composed of four classes:—

1. Floating fortifications and batteries for harbour and coast defences. These should be of the same character, but of two kinds, differing in tonnage and powers of locomotion. They would be protected with the strongest and heaviest iron armour they could carry, and armed with the heaviest guns that could be constructed. They should be fortresses afloat, so invulnerable and so powerful in armament that no sea-going ships could contend against them. For the defence of the channels leading to a dockyard or arsenal, as at Spithead, the largest vessels of this description would be permanently stationed. They would replace the proposed fixed forts, and be constant ramparts of defence. They would not require great speed, as their duties would be, not to escape from or give chase to an enemy, but to oppose his approach or entrance into the Channel, and, if he entered by surprise, to follow him up and engage him in close conflict; in which such floating batteries on the revolving

power, or some other gun-shield plan affording complete protection to the crew, would have a decided superiority over any Warrior or La Gloire sea-going ships that could be built. For coast protection, the vessels would be of the same character, but smaller dimensions and greater locomotive power, so as to be able to steam readily to any point of danger, and repel invasion.

2. Line-of-battle ships carrying the strongest armour-plating and the heaviest armament consistent with the moderate degree of speed required, to manœuvre and maintain their position in a line of battle. These vessels should be not partially but wholly protected from stem to stern, and especially between wind and water. Neither weight of armour nor of guns must be diminished for the sake of speed. Better to sacrifice two or three knots an hour and have increased power, offensive and defensive, in the day of battle. The history of great naval battles teaches us that speed is not an essential property of the sea giants which engage in those tremendous conflicts. When the powerful fleets of hostile maritime powers put to sea, their object is not to avoid but to seek and encounter the enemy and fight a great battle; and if flight after defeat might render speed desirable, the deficiency of that strength which was sacrificed for the sake of speed would probably be the cause which made flight necessary.

3. Cruisers of every denomination which would carry a lighter armament, and comprise in their construction all the requisites of speed and power consistent with sufficient protection, and the means of contending successfully against an enemy's cruisers of the same class.

4. Gun and mortar boats for service in rivers and shallow waters at home and abroad.

It is not our purpose now to enter into the details of the requisite conditions of construction, but simply to designate the character of the vessels of this and the other classes. By an intelligent adherence to this classification, and constructing each class perfect in its kind, the Admiralty might endow the country with an efficient navy; but to carry out this programme successfully there must be a thorough reform in Admiralty administration, and a much higher order of engineering talent must be brought into action than that which designed the half-protected, unmanageable Warriors, the Defence tubs, or the "wooden-bottomed" Enterprises.

MAIN DRAINAGE WORKS OF THE METROPOLIS.

The main drainage works for the metropolis are really making rapid progress. On Saturday last an inspection took place under the guidance of Mr. Thwaites (whom we are glad to see convalescent) and Mr. Bazalgetti. The entire staff of officers of the Metropolitan Board of Works and a large number of visitors were present. The party started by steamboat from Hungerford Market between eleven and twelve o'clock for Greenwich, and upon landing at the pier they at once proceeded to the immense sewer constructed by Mr. Webster, extending from Deptford Creek to Crossness Point, Plumstead Marshes. This sewer is completely circular, 11ft. 6in. in diameter, and 18in. thick, except that part of it which passes under Woolwich, where it is 2ft. thick and seven miles and a half in length. The sewer was lighted by hundreds of candles placed at regular distances from each other; and the effect when viewed, as far as the eye could reach, was really marvellous. The pumping station at Deptford was next examined, by means of which the sewage will be pumped from the low level to the high level sewer; and the magnitude of the works excited the greatest surprise.

The whole of the company were then escorted to the river side, where a steamboat was in waiting, and they crossed over to the Bow and Stratford branch of the Eastern Counties Railway, and on it were conveyed to Old Ford. Here the completed northern high level from Hampstead, a length of 9½ miles, and the work of Mr. Moxon, was examined, together with the penstock chamber and overflow channels. Here is a junction of the Middle Level Sewer, 12ft. in diameter, and by the aid of the penstock and overflow channels, the sewage can either be continued on its course to the outlet or passed into the River Lea, which at present receives the sewage of that district. From this point the Northern Outfall Sewer is now in the course of construction by Mr. Furness, and will terminate at Barking Creek. This work will be 5½ miles in length, consisting of double and treble lines of sewers, each 9ft. in diameter, and for a considerable distance they will be from 15ft. to 17ft. above the level of the surrounding land, the sewers themselves either resting on an embankment or brick arches. In its line there will be seven aqueducts over rivers, two aqueducts over railways, and the materials employed in the construction of the sewers, concrete embankment and substructure of arches through the marshes, will consist of 20,000 rods of brickwork, 500,000 yards of concrete, and 100,000,000 bricks. The contract price is 625,000*l*. These sewers at Barking will discharge into a reservoir, which will cover an area of no less than 12 acres, and from this reservoir it will be discharged into the river during the ebb of the tide. All these works were minutely examined, the party proceeding to Barking in the contractor's trucks on a railway laid down to facilitate the carriage of materials from the river to different parts of the works.

After the inspection a luncheon was enjoyed, and several congratulatory speeches delivered.

INFLUENCE OF RAILWAY TRAVELLING ON HEALTH.

Our readers will remember that we published a few months since a valuable paper, which was read before the Society of Arts, on the influence of railway travelling on health. Since that time the question has been amply discussed in the pages of the *Lancet*. The series of papers on the question in that journal are now published in a pamphlet by Hardwicke, Piccadilly. The following summary cannot be too widely circulated:—

It is unnecessary to do more than allude to the accumulated evidence which accomplished observers of health and disease have contributed to our report on the influence of railway travelling on the various organs and parts of the body in health and disease.

The efficiency of the rapid concussions incidental to railway travelling in developing or aggravating epilepsy, clonic spasm, cerebral softening, and spinal softening, has been studied, not by the light of vague conjecture, but upon the authority of strictly-observed cases in the practice of Sir Ranald Martin, Dr. Brown-Séquard, Dr. Radcliffe, Mr. Ernest Hart, and others. The particular influence of cold and draught has been brought out prominently by Dr. Williams; while this has been placed in necessary juxtaposition with the exact enquiries as to ventilation and relative purity of the air in railway carriages by Dr. Angus Smith. The mischief following from undue retention of the secretions is sufficiently and practically illustrated in the case by Mr. Hilton. The nature of the impressions on the eye, so well studied by Sir David Brewster, has been traced to its pathological consequences by Mr. White Cooper. Dr. Fuller's ingenious observations on the part played by the auditory nerve in conveying to the brain strong and incessantly repeated impressions of sound, are of a practical and suggestive character. This is, no doubt, one cause of the peculiar effects of continued railway travelling which had not been well known, and of which the mischief is preventable. The almost certainty with which a long railway journey will, in some pregnant women, produce abortion, has been well illustrated in the communications by Dr. Meadows and Dr. Graily Hewitt. The acceleration of the pulse in railway travelling is one of the indications of the extent to which this form of passive exercise taxes the system; but all physiological deductions require to be received with great reservation, as the disturbing elements are so many and various.

There are only two classes of persons especially likely to be injuriously affected by moderate railway journeys, even though frequent: they are persons advanced in life and of weakened power, and those who are subject to the special diseases which have already been studied in this relation. The actual exertion, the excitement, the mental strain, the peculiar influences of the motion of a railway carriage, indicate its dangers to those first mentioned. These constitute a small minority. But there are a number of persons who, although not far advanced in age, are yet the subjects of various conditions of ill health depending on insidious degenerative disease of the brain and heart. The season-ticket holders of the railways are, in large numbers, men who have passed the best years of their life in hard and exhausting employment of mind and body. They are the successful merchants; the senior partners of flourishing firms, which they have built up by a life of labour; half-retired tradesmen; half-invalid bankers, *et id genus omne*. We can now see that it is by the injuries which have resulted to these men from their constant travelling to and from town that an impression has become current as to certain mischiefs which habitual travelling inflicts. When it was known that such a banker, who comes up fifty miles three or four times a week, has to lie down half an hour before he can sign a cheque, that such a well-known chemist has suffered from symptoms of brain excitement since he bought his new house by the sea and travelled daily to London, or that a certain barrister has found himself obliged to pay for his journey by epileptic seizures, the alarm soon extended beyond reasonable limits. But few men can endure without suffering to travel fifty or a hundred miles daily to their business for any length of time. The influence of the journey itself is heightened by many accessory conditions to which we have adverted; and the present construction of the rails and carriages is such as to deprive the traveller of all those mitigations by which his discomfort might be diminished and his health safe-guarded.

Catching the train.—Amongst the unprecedented collection of cases brought under our notice during this enquiry, there have been recorded several of serious mischief, and even death, from persons in ill health hurrying to catch trains, and sitting down, heated and breathless, in the draught caused by the moving of the train which they have just managed to be in time for. It is almost exclusively at large termini that these cases have occurred, and that the cause of them obtains. Now, this rushing in at the last moment, we are informed, is becoming more frequent; and consideration of the condition in life of those who constitute the majority of season-ticket holders would indicate how this evil arises. We believe it would be advantageous to public health and safety, however harsh it may at first appear, that the doors at termini should be closed five minutes previous to the departure of each train, so that sufficient time should be allowed for passengers to quietly settle themselves, and also for the officials, who are often (as one of them graphically expressed it) "torn to pieces" just at the last moment. It is well known that the difficulties with luggage, which this arrangement would obviate, are frequently causes of delay in starting trains. Then there is high speed to make up lost time or want of punctuality—both of them fraught with danger to passengers.

Cautions to habitual travellers.—It has been shown that the injurious effects which habitual railway travelling produces on some who escape such influences when only taking occasional journeys are very marked. In such persons heedless continuance comes to be a cause of disease. In some, there have been no previous symptoms that

they could recognise, or such as would have deterred them from undertaking the daily journey; and thus the season-ticket is taken, and has soon to be disused, or the health suffers. In all cases the evidence points to the conclusion that the injurious influence slowly and gradually increases whilst the cause remains—that tolerance is not established by persistence.

It is too much the custom, when adopting a country residence on a railway line, to make no new arrangements of business according to the diminished time for work which the daily interval between the morning and evening trains allow: hence that hurry, anxiety, and working of the brain at high pressure, which of all things tend to develope in susceptible persons such injurious effects on health as habitual railway travellers often experience. The remedy for this is obvious: "Cut your coat according to your cloth"—"Meno tenus propriâ vive"—"Selon le pain il faut le couteau"—are saws proved to be wise. But we believe that no person is justified in undertaking a series of continuous journeys by rail under the conditions alluded to (if under any circumstances) without previously consulting his medical attendant as to their probable effect on his health, the precautions he should adopt, and the warning symptoms which he may not safely disregard. In aid of such decisions, we trust that these reports, now brought to a conclusion, may prove helpful.

AMERICAN INVENTIONS.

At a recent meeting of the Franklin Institute, Philadelphia, Mr. Howson exhibited a patent naphthometer, or benzine detector. This is the invention of Messrs. H. J. Smith and Woodruff Jones of this city. The instrument consists of a reservoir with a tightly-fitting cover, from the top of which projects a tube, surrounding a wick tube. A thermometer also passes through the cover, and occupies such a position that its bulb comes within a short distance from the bottom of the reservoir. In order to determine the temperature at which the oil gives off sufficient vapour to cause an explosion, the oil to be tested is poured into the reservoir, the wick is lighted, and the instrument placed on a stove, or over the flame of a lamp. At a temperature which varies in proportion to the quantity of explosive ingredients contained in the oil, the vapour is given off, and mixing with the air in the reservoir passes up through the space between the wick tube and the larger tube, and explodes when ignited by the flame, thereby extinguishing the light. The height of the mercury in the thermometer will determine the quality of the oil. The contrivance is very simple and cheap, and enables anyone to ascertain in a few minutes whether an oil is of a quality to be burned with safety.

A heater to be applied to coal oil lamps was also exhibited by Mr. Howson. This instrument, the invention of Mr. Woodruff Jones, is intended to be used in sick chambers for heating articles of diet, &c. It consists of a metal cylinder or casing, the upper edge of which is provided with a ring, and the lower with a flanch adapted to the burner of a coal oil lamp, so that the heat of the flame may be communicated to articles of food, &c., contained in a vessel resting on the ring.

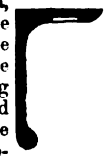
Mr. Howson then explained Mr. Cooley's patent mode of discharging projectiles. The shot or shell has an orifice into which fits a solid cylinder, and between the end of the latter and the end of the recess intervenes the charge of powder. The cylinder is surrounded with a shield, which prevents the products of the ignition from injuring the gunners.

Mr. Howson also exhibited a cavalry sword and several varieties of tools with the gum elastic handles, patented by M. C. Bogia, Esq. These handles have been highly approved of as presenting a slightly yielding surface, and one which affords the means of maintaining a firm grip in the hand. It is applicable to all descriptions of tools.

A. F. Ward exhibited charts, and explained his system of semaphoric colour signals. This system has been brought to a high state of perfection by Mr. Ward, and has been recommended to Congress by the Board of Trade of this city.

Mr. John W. Nystrom exhibited some specimens of angle-iron and keel-gutter, made by him at General Maltsoff's establishment in Russia, and made the following remarks:—

This form of angle-iron is best adapted for frames and beams in river steamers of light draft. The dimensions of one of the specimens shown is $1\frac{7}{8} \times \frac{5}{16} + 2\frac{7}{8} \times \frac{3}{16}$ inches, weighing 4·125lbs. per foot; and of the other, $2\frac{1}{2} \times \frac{3}{8} + 4 \times \frac{1}{4}$ inches, weighing 5·47lbs. per foot. The improvements in this angle-iron consist, 1st, in a bead on the one edge, which makes it stronger, and about 20 per cent. lighter than ordinary angle-iron. Experiments on its strength were made in Russia, but the results have been lost. The bead is placed on the inside of the angle-iron, so as to make the frame lie flat on the cast-iron form when bending it. 2nd, the countersunk holes rolled in the angle-iron, as shown in the sample. In the ordinary iron ship-building practice, the angle-iron is generally bent into the shape of the frames, after which the holes are drilled in. If the holes are punched first, the angle-iron does not bend so well, and the holes will get out of shape in sharp curves. When the angle-iron is bent, the holes cannot be punched, because the punching would throw it out of shape. Now, rolling the countersink, leaving a thickness of about one-eighth of an inch, allows the angle-iron to be bent into shape, after which the balance of the holes are punched out by a hand-press without altering the shape of the frame. In Russia, I had it so arranged that the angle-iron was taken direct from the rolling-mill, bent and bevelled to the true shape of the frame in the one original heat as fast as the angle-iron could be rolled. The deck-beams were made of similar sections to the frames, but of larger size, and bent into shape in the original rolling heat.



The third sample here exhibited is the form of the keel of the steamers which I built in Russia. It is in the form of a U, with rolled countersinks. We called it the keel-gutter, because it is used for that purpose in conveying the bilge-water to the pumps.

Except for balloon navigation, there is no case where combined strength and lightness require such careful consideration as in light draft river steamers, where an inch or two more draft of water may render navigation impossible. One river steamer, the Astracan, which I built for the river Volga, was of the following dimensions:—Length in water-line, 234ft.; breadth of beam, 22ft.; engines, oscillating; two cylinders, 54 by 54in. To carry 400 passengers and 32 tons freight, including 8 tons for passengers' baggage; with fuel on board for six hours at a speed of 20 to 25 versts per hour, the steamer drew only 3ft. 4in. of water. The angle-iron in that steamer amounted to 9,000ft., which, with 20 per cent. difference in weight, will be about 8,000lbs., or about 50 passengers, or about 2in. in draft of water.

THE PHYSIOLOGY OF SEA-SICKNESS.*

By Richard Meade Bache,
Assistant U. S. Coast Survey.

(Concluded from page 85.)

At sea, motion immediately nauseates, even when it is much less than may be experienced in a swing without the slightest impression. In a swing motion is comparatively regular. It requires little education of the senses to enable them to keep pace with each other. The evidence of the sight is nearly the same as that of the feeling. If a person in a swing is blind, or keeps the eyes shut, there are still measures of the extent of motion. These measures are, firstly, the points of highest elevation and greatest depression—secondly, the corresponding intervals of time—thirdly, the perception of the rush in progressing through the atmosphere; for not only does the cessation of the rush indicate the points of greatest elevation, but its increase or diminution indicates continuously all other points. Hearing may also be mentioned, as it contributes to the conviction of the mind as to the uniformity of the motion to which the body is subjected when swinging. All these certainly give a most accurate idea of the segment of a circle which the body is describing in the air. Nausea can be produced in a swing, but it requires very little education of the senses to enable a person to bear the motion.

I have been told by a person who attempted to prepare himself for a sea voyage by using a swing, that the process was entirely unavailing: yet I doubt very much whether the motion to which one is subjected at sea is often greater than can be attained in a well-constructed swing. But the motion of a swing is quite uniform; that at sea far from it: and the failure of the swing to inure a person to unequal motion, shows that it is not motion which affects us, but inequality of motion, and that it is not the mere mass of flesh and digestive organs which are alone concerned, but other elements as appurtenances of the body demand our consideration, and, as I hope to prove, merit it far more than the mere body and stomach, which becoming diseased only react. If it be said that animals, such as horses and dogs, become sea-sick, and yet have no such nice senses as we have, excepting perhaps scent, I answer by saying that a horse is always terrified at movement in which he does not see the cause, even terrified at perfectly noiseless movement. What is it which prompts a young dog to jump at all hazards from a vehicle in rapid motion, even when driven by his own master, and what makes him eventually delight in riding? Preconceived ideas of motion, when violated, bring terror to both horse and dog. The conditions of novel motion once accepted, the senses are reconciled, and habit is the result. If, then, we allow these animals to possess habitual conception of motion, they must be affected at sea as human beings are in the same manner if not in the same degree. The tumbler pigeon precipitates itself with a revolving motion towards the earth, but does not appear to be at all affected by the motion which its body has undergone. If the same bird is taken in the hand and its head placed under one of its wings, and it is then whirled around, it may be placed on a table, and during a few moments it will appear lifeless. Aquatic birds of the greatest vigour in flight, and habituated to floating on stormy waves, often become nauseated on the decks of vessels.

Let us now consider the motions at sea. A ship rolls, plunges, seems to pause, then dart, and every movement brings the passenger increased uneasiness. There is no precedent in his experience for such movement. If he possesses sight, the view of objects is at variance with all that he has been habituated to in other motions. If he is blind, his mental conception—the picture in his mind—is equally at variance with his habitual conception. In a few days, in either case, the person would be indifferent to the motion. He will have learned, in the meantime, to reconcile the evidence of his senses. If he possesses sight, it will have been educated in conformity with unequal motions, just as it was educated from childhood to comparatively equal ones; or if he is blind, his conception of the appearance of motion will have been reconciled with motion experienced. In either case it is the conception of the appearance of motion as contrasted with the feeling, which conception will have reconciled itself with existing conditions. Both those who see, and the blind, possess this habitual conception, which is never shut out from the mind, as has been shown. Closing the eyes will not discard it. If it did, everyone subjected to unusual motion could in that way secure immunity from nausea. This has been shown not to be the case.

Let us now consider the peculiar effect of unequal motions upon the human body. It is my conviction that motion is nauseating whenever the estimate of its extent does not correctly precede it.

* Read before the Connecticut Academy of Arts and Sciences, January 15, 1862.

The mind mechanically calculates what is to take place while it is taking place.

I shall now endeavour to show that "motion is nauseating whenever the estimate of its extent does not correctly precede it." I have already shown that motion is not nauseating per se. I have also shown that when it does nauseate, it is when the brain is impressed. The question naturally suggests itself here as to what there is in the impression produced on the brain which affects us unpleasantly and produces nausea. It is the idea of undefined movement of the body of the observer. Back of this I do not pretend to go. Nature has so constituted us that undefined motion is repugnant to our organisations. Nauseation from motion proceeds from the idea present to the imagination, that the body is the subject of undefined motion. The nauseation of sea-sickness, of course, eminently proceeds from undefined motion. But to the proof—an experiment which anyone can make. I have often lain awake at night in the cabin of some great ship at sea, and gauged the motion and calculated the capability of the passengers to resist an access of nausea. Choose a time when there is a regular sea and wind, when the ship ploughs along pretty evenly. Now and then seas will rise somewhat higher than the rest. Sea-sick passengers habituated to uniform motion, at the intervals when the ship has been accustomed to rise or to fall, feel that they rise still higher or fall still lower. The difference in motion is not perceptible in violence, and yet causes many to give involuntary evidence of the occupancy of their state rooms. The strain of fancy is ever exerted and *solicitous* to imagine and attain the turning point, although after it is gained the motion, as in a descent, may be still more rapid. Let anyone who has been at sea recall how trying was a continuous movement in one direction, even a long rise upon a wave, when the motion is certainly not as swift as in a descent; and at the same time remember how small the motion of a long gliding rise or descent is as compared to much that one is subjected to at sea—how much less violent. The effect upon the observer is produced simply by the difference of motion—by ignorance of the extent to which it is going—by the idea of undefined motion. When one's senses are educated in the novel condition of existence at sea, the motion is no longer undefined. A ship could make no movement which would not be accompanied by a corresponding idea of space passed through. There is no motion at sea which by habit will not cease to appear undefined, but if it were possible for a ship to mount heavenwards, and to sink rapidly near to the bottom of the sea in alternate movements, it is my belief that the hardiest sailor would become sea-sick.

The summary of what I have attempted to demonstrate is this, that sea-sickness is not the result of motion per se, nor of the appearance of motion per se, but is the result of the senses "violating the habitual conception of contrasted effects of motion," and producing on the brain the idea of undefined motion. When the senses are educated to form cooperating and agreeing measures of the novel condition of existence at sea, nausea ends. If they never formed these measures nausea would never end.

For another proof of this theory, take the case of an infant. Instances of children in arms being sea-sick are very rare. A child certainly feels the motion, that is to say, its body is subject to the motion equally with that of the oldest passenger. But a child undergoes motion without *feeling* it. It sees, too, without *perceiving*. In its case nothing conflicts. It is as ready to be rocked on the billows as in its cradle. Its youth precludes the possibility of its having any habitual conception of motion from the education of the senses, and if it feels any sensation, that sensation is at variance with nothing. As soon as children begin to "take notice," as it is called, the education of the senses begins, and thus we find that children shortly afterwards, at the age of two and three years, are attacked by sea-sickness, but they recover long before adults are secure from it. The case of a blind man, because he cannot see and consequently cannot perceive, is not in any respect similar to that of an infant, for I have shown that the mental picture may conflict with reality, and the blind man has the mental picture—the idea of space, motion, speed, everything, excepting colour. Not only are babies not usually afflicted with sea-sickness, but just in proportion to the youth of children are they exempt from it. Since my own observation indicated what has been asserted in regard to the immunity of babies from sea-sickness, I have enquired of persons of experience whether their observation tended in the same direction, and I have been confirmed in my belief.

It has been asked by a friend, to whom I communicated this theory of sea-sickness, whether the insane are sea-sick, and an answer in the negative would certainly seem to corroborate the theory. Thus far, however, I have been unable to ascertain, as the insane are so rarely allowed to go to sea that it would require long and patient investigation to determine the point. Immunity from sea-sickness in a very few cases might be a mere coincidence. As far as the answer has been made to my enquiries, I shall give the result. I know of two persons who, there is every reason to believe, never had been at sea until a voyage when they laboured under the "mania à potu." These persons did not become sea-sick. Another case of which I have reliable information, is that of a young girl who was insane, and who was taken to sea by her father, who was the captain of the ship. She, too, was not sea-sick. I should be very sorry to mar a strong case of evidence in favour of the theory which I have advanced, by an assertion of the truth of which I am not positive, even if I were willing to state anything of which I am not absolutely certain. I give my investigation of this subject for what it is worth in the thoughts of those who may read this article. I shall not support my theory in any measure whatever upon the result of that slight investigation; therefore I do not assert that the insane are not liable to sea-sickness.

I think it sufficiently clear from all that has been said, that impression of the brain is the cause of nausea on the ocean, since I have shown that it is not motion per se, nor the appearance of motion per se which causes it, but an *idea*, which I have termed one of undefined motion, derived, when the body is subjected to motion in an unusual manner, from the "violation of the habitual conception of contrasted effects of motion." There are minor causes of sea-sickness, or rather not so much causes as aggravations of it. These are close cabins, smell of bilge-water, unusual food, and, as I have said, the stomach reacts upon the brain.

A precaution frequently taken by people about to commence a sea voyage, is to eat nothing, or scarcely anything. Another precaution taken is to get immediately into a berth. Neither plan is good. Neptune is the most insatiable highwayman on the globe, and attempts to levy toll on all. The traveller who comes totally unprovided fares badly, if he cannot successfully resist. In plain English, the stomach is weakened by want of food, and is therefore more liable to be acted upon in the production of nausea, and if nausea should ensue, retching is probably more distressing without than with food. Lying down is an excellent plan to adopt for the purpose of avoiding nausea, but when the posture is assumed in a berth with the nauseous swell of bilge-water around, and, as is often the case, with a tin vessel of questionable nicety hooked on the edge of the berth, the plan is no better than the first.

Persons frequently imagine that some particular article of food cured their sea-sickness. It is a general rule that, whatever a sea-sick person is able to eat at all while sick, or convalescent, gets the credit of the cure. The most heterogeneous articles are spoken of as specifics. The best preparation to avoid sea-sickness is to go aboard ship with the stomach supplied with its accustomed amount of food. It is best, as far as possible, to maintain the habits of shore.

Many reasons combine to render the deck of a vessel in anything like fair weather the proper place to remain, either to avoid sea-sickness or to recover from it. It is there that the sight can be more quickly educated to the movement than it can be in the cabin. The crests and troughs of the seas can be observed, and thus it can be seen just how far one has to rise, just how far to fall. Persons will frequently find that a view of the waves has a beneficial effect in stilling nausea suffered more severely in the cabin. This is not only on account of the fresh air on deck, but because in the cabin the idea of motion is more undefined. The view of the horizon also has a most beneficial effect. The horizon is the only object which has the appearance of remaining stationary, and the motions of a ship are readily graduated by keeping the gaze directed to it. On deck the miserable sea-sick passenger can breathe the fresh air, in lieu of the conglomerate smells in a cabin aboard-ship. He can also choose a position amid-ships, where there is the least motion of any place on deck. Then there are more agreeable objects to look at on deck and beyond than in the cabin, and it is very important that the mind should be distracted from the passing scene, or what is disagreeable or most so in it.

If, in addition to what has been recommended, the passenger will spread a mattress and put himself in a recumbent posture, all will then have been done that can be done to prevent, to cure, or to alleviate sea-sickness, until the education of the senses is completed.

A NEW METAL IN THE NATIVE PLATINUM OF ROGUE RIVER, OREGON.

By C. F. Chandler,

Professor of Chemistry at Union College.

In examining native platinum from the above locality, more than a year ago, I became convinced of the probable existence of a hitherto unobserved metal. I have deferred publishing my observations, hoping to obtain material for a more complete examination; in this I have thus far been disappointed.

The quantity of platinum examined amounted to only a few grammes. It was digested with hydrochloric acid to remove impurities, and the solution thus obtained was subjected to the ordinary routine of qualitative analysis.

A brown precipitate was produced by hydrosulphuric acid, which dissolved readily in hydrochloric acid on the addition of a crystal of chlorate of potassa. In this solution metallic zinc produced a precipitate which resembled metallic tin obtained under similar circumstances. This precipitate dissolved readily in hydrochloric acid on the application of heat; but the solution thus obtained had no effect on a solution of protochloride of mercury (HgCl), and on cooling deposited a small quantity of minute crystals. To guard against error, these experiments were repeated two or three times on small portions of the original solution, always with the same result.

The chloride of this metal differs therefore from the protochloride of tin, in not reducing protochloride of mercury to calomel, and in being but slightly soluble in the cold.

On mentioning my observations to a friend, I was referred to Dr. F. A. Genth's announcement of a new metal, made in 1852, of which I was not previously aware.

The metal observed by Dr. Genth occurred among grains of platinum from California. It was malleable; it fused readily on charcoal before the blowpipe, becoming covered with a coating of black oxide; it dissolved in borax to a colourless bead, which became opalescent on cooling; it was dissolved by hot hydrochloric acid and by nitric acid; and its solution gave a brown precipitate with hydrosulphuric acid. It seems quite probable, therefore, that the metal which I have observed in the Rogue-River platinum is identical with that observed by Dr. Genth.—*Silliman's American Journal*, May 1862.

Schenectady, March 6, 1862.

SEVEN SUGGESTIONS,

Respectfully submitted by W. Austin, C.E., to His Grace the Duke of Somerset and the Lords of the Admiralty.

1. The formation of a flotilla of gun-boats and ships of war, as a "belt of guard-ships" round the coast, placed at ten or fifteen miles apart, at signalling distances, and changing berths successively through the belt, so that the officers and crews would thoroughly know the points and bearings of the general coast; and at a given signal fleets of thirty or forty sail could be congregated together, in a few hours, for defence of any assailable position.

2. The construction of sunk trenches or railway cuttings on the shores of beaches, cliffs, and headlands around the coasts of Great Britain, &c., with strong trams or railways and eight-wheel trucks, on which guns pivoted would be mounted, so as to revolve and fire all ways, and be propelled by steam or horse power — constituting a swift-running, or what may be termed a flying, battery for shore defences.

3. The construction of "floating breakwaters," which could, on emergency, be mounted with powerful guns or mortars, and form "floating batteries" for the entrances of harbours, channels, rivers, bays, &c., and which could, if necessity demanded, be temporarily sunk, and thus form "shoal obstructions" to entrance or passage of an enemy's ships.

4. The construction of "floating steam-ship gun batteries," to be driven ahead or astern by steam-paddles, placed inboard, with the capabilities of reversion and quick revolution, or turning around of the port and starboard broadsides in quick succession, and requiring no screw propeller or rudder, the head and stern being alike, and each formed and fitted for powerful ram action.

5. The construction of "iron armour shutter plates" inboard of the port-holes of ships, to protect the men at the guns whilst loading. These shot and shell proof shutters being easily moved to and fro by the hand, it would supersede the present ineffective iron plates.

6. A new mode for fixing armour plates to a wood ship's sides, so as to be easily removed and reinstated, if damaged in action, and also by being properly backed with hard rammed sand interstices, the plates would not be cracked or the timbers shivered by concussion. A lighter and stronger armour plate (without bolt-holes) is submitted in preference to the present lumbering plates, which cannot be handled but with immense powerful lifting gear, going into dock to repair.

7. The coating over the present timber-planking of ships' decks and sides with fire-proof and shot and shell proof flooring, so as to be impossible to set fire to a timber-built ship either by design or by accident.

THE ARMSTRONG GUNS.

The following conversation took place in the House of Commons on Thursday week relative to the Armstrong guns:—

Mr. Osborne wished to put a question to the Secretary for War. Certain experiments had recently been made at Shorncliffe with a light 12-pounder rifled gun, and especially as to the effect of rapid firing. He believed that a commission of officers had been appointed to report upon the condition of those 12-pounder guns after rapid firing, and he wished to ask, first, whether those officers had made any report upon the condition of the 12-pounder Armstrong gun after the experiments in rapid firing; and, next, whether it was true that a large proportion of those guns were altogether unserviceable, being greatly damaged by the shifting of the external coils, the splitting of the internal coils, the chipping of the screws, and the breaking of the vent pieces. (A laugh.)

Sir G. Lewis said, although he had notice of the intention of his hon. friend to ask a question, he had not been aware of the particular report to which he intended to refer. He had received a report from Colonel Cuppage of the results of certain experiments with the Armstrong 12-pounder gun, which had lately taken place at Shorncliffe, but those experiments were of three kinds. Some of the firing was at 1,000 yards against targets to try the effect of landing from boats; other experiments were at various ranges, in order to test some assumed defects in resisting cavalry; and, lastly, experiments to test the effects of rapid firing. He believed the report upon all the three classes of experiments was that they were eminently successful.

Mr. Osborne.—But as to the present condition of the guns? (Hear, hear.)

Sir G. C. Lewis.—The report relates to the success of all the experiments.

Mr. Osborne gave notice that next Session he would call the attention of the House to the present condition of the War Office, in regard to the management of rifled ordnance, and to the position of Sir W. Armstrong as Director of Rifled Ordnance. (Hear, hear.)

In reply to Sir De Lacy Evans, Sir G. Lewis said that it was impossible to lay any report upon the table during the present Session, but the hon. and gallant member could revive the subject in the next Session.

LAMBETH SUSPENSION BRIDGE.

The Lambeth Suspension Bridge, the cable of which was fixed a few weeks ago, will be completed in about two months. On the Westminster shore it was found on taking borings that there was a large deposit of peat, and, in order to avoid the expensive plan of making a cofferdam, Mr. Barlow, the engineer and designer of the bridge, adopted the more manageable plan of sinking cast-iron boxes. These boxes, which are 12 in number, consist of ½-inch plates, bolted together, each 12 feet in length and 8 feet in width. At low water the workmen excavated in the interior of these boxes, until they got through the treacherous peat, down to the solid gravel—the boxes, of course, following. They were then filled with concrete flush to the top, thus forming a solid foundation for the masonry of the abutment. On the Lambeth shore these boxes, or miniature cofferdams, were not required, there being good gravel a few feet beneath the surface. There are two piers in the river, giving three spans of 280 feet each. Each pier consists of two cylinders 12 feet in diameter (the first ring having been lowered on November 11, 1861). These are sunk to the depth of 16 feet below the bed of the river, 10 feet of which is composed of London clay. The cylinders were then filled with concrete to the depth of 9 feet 6 inches, and a ring of masonry 2 feet 9 inches thick, the whole height, leaving the inside of the cylinder hollow, so that any portion of the work may be repaired at a future time, if necessary. On the top of this masonry are cast-iron bed-plates to receive the towers. These immense towers are of wrought iron, and were made at Messrs. Porter's works, in Staffordshire, were sent off complete, and lifted each in one piece from the barge on to their beds. The roadway consists of two massive longitudinal box girders, which are attached to the vertical bars or suspenders; the cross girders are fixed between these girders at intervals of four feet, and carry plates of three-eighths of an inch in thickness, which are now being riveted, with the addition of longitudinal angle iron, on to the girders. They will then be protected with asphalte, and will receive a covering of about nine inches of roadway metalling. On the outside of the box girders are fixed wrought-iron brackets, four feet apart; these are intended to carry the foot-passenger traffic, and will be plated like the roadway and covered with stone slabs. These footways will be protected with neat lattice-panneled hand-rails. The whole weight of iron-work, inclusive of cylinders, boxes, and the whole of the massive girders for the anchorage of the wire cable, will be about 700 tons. Messrs. J. H. Porter & Co. are the contractors.

COHEN'S COMPRESSED CUMBERLAND LEAD PENCILS.

Everyone who has daily to use a lead pencil appreciates a thoroughly good one. Of late years, the luxury has been denied us. We have tried many sorts, and have found them either metallic, gritty, and indelible, or else rotten and smeary. We tried every sort we heard of, but with one or other of these results, more or less combined. Some of them would work very well for a short time, but suddenly, without warning, our growing confidence was destroyed, and we were obliged to class all in the same category. About a year ago a friend sent us to Newman's, in Soho Square, in order to make trial of Cohen's Compressed Cumberland Lead Pencils. Since then we have used no others. We have given them a long trial. We have used them for outlining perspectives, for rough sketching, and for drawing on wood. In all instances they have answered our wishes. We could desire no better pencils. The points are as firm as the shiny rivals which have been so extensively used, spite of their indelible properties. Their marks are easily and completely rubbed out. Their tone is equal throughout, being made in one single piece instead of in a number of pieces; and—what, however, is a minor consideration with good articles—they are cheap. All the degrees from B B to H H H H are 2*s*. 6*d*. per dozen. The extra degrees, such, for example, as B B B B and 6 H, are 5*s*. a dozen.

Having used them constantly, we are pleased to find a stall erected in the Process Court of the International Exhibition to exhibit them in course of manufacture. We there may now see a man fitting the solid bars of lead into the grooved halves of the pencil, and glueing the other halves to them, binding them tightly together to insure their perfect adhesion, and handing them, when dry, to a fellow-workman, who, with a plane, shoots off the angles and turns out the pencils ready for use. The lead is made from the Borrowdale plumbago; the pencils work freely, with an unequalled smoothness as well as firmness of touch. We recommend our readers to make a trial of them.

A NEW TRIGONOMETER.

Mr. Josiah Lyman, of Lennox, Massachusetts, has invented a new trigonometer. It is said to consist in a combination of the protractor, straight edge, and scale of equal parts. It is to be used in connection with a draughting board which has its sides adjustable. The long side of the semicircular protractor being placed against the edge of the draughting board, the steel ruler may be turned to make any required angle with the edge of the board. The angles are read by a vernier to minutes. A tangent screw and clamp afford facilities for small movements. Upon the ruler slides a scale plate for measuring distances, or for laying them down. There are six scales, representing divisions of 1 inch into 8, 10, 12, 16, 20, and 24 parts. Each has a vernier to tenths, and on most of them smaller parts may be estimated. The edges of the two parts of the sliding rule come down over the edge of the ruler to the surface of the paper, and five marks on these edges make it easy to lay down accurately on the paper the distances indicated on the scales and verniers.

It is said that this instrument affords the means of plotting angles and distances with great accuracy and despatch. The aim has been to make it possible to lay down angles to minutes, and distances to thousandths of an inch. One great advantage of the instrument is that it facilitates the computation of areas in land surveying. When the corners of a field have been plotted, the differences of latitude and the meridian distances can be measured, in a very short time, with an accuracy far greater than that ordinarily used in the field-work of a survey. Great pains have evidently been taken to make the instrument accurate.

It is said that copper containing 24 per cent. of phosphorus will resist a strain of 48,000 lbs. to the square inch.

SHEPHERD'S APPARATUS FOR CLEANSING STEAM BOILERS.

FIG. 1.

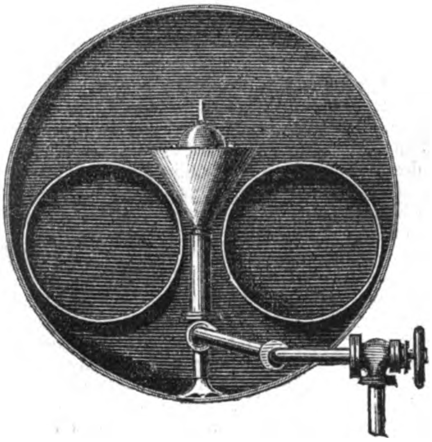
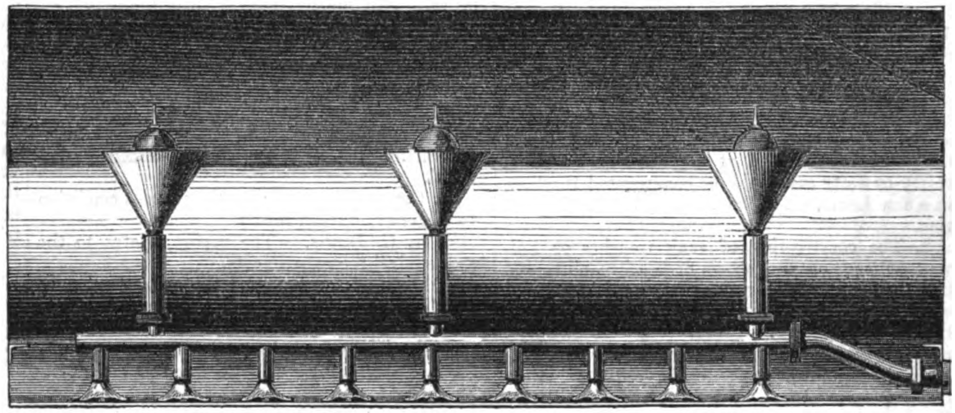


FIG. 2.



Mr. J. Shepherd, of Manchester, has patented an apparatus for cleansing steam boilers, of which the following is a description:—

In order to collect, carry off, and discharge the sludge, sediment, and scum contained in, and formed upon, the surface of the water in steam boilers, particularly during ebullition, one or more floating receivers are employed, made buoyant by air-tight chambers, balance weights, or other suitable means to render them movable. The floating receivers are adjusted to any given distance below the surface of the water, as may be found desirable, and are connected to the waste pipe or pipes by tubes within each other, similar to a telescope, or by jointing one tube so that it can work in or over another tube, in order that the receivers may rise or fall with the surface of the water, as it varies in height or depth, the collected refuse being discharged from the receivers and waste pipe or pipes by taps, valves, or other suitable means.

In order to expel from the boiler such sludge, sediment, or other matter that may fall to the bottom part of the shell or framework of the boiler, one or more vertical or other shaped pipe or pipes are employed, fitted with a rose, perforated disc, or conical mouthpiece; these pipes, or under sludge extractors, are connected to the main waste pipe, the whole area of the openings into the said main or chief waste pipe to equal but not exceed the area of the said main or chief waste pipe.

These improvements will be clearly understood by referring to the above engravings, in which figs. 1 and 2 are transverse and longitudinal sections of an ordinary steam boiler, having the improvements attached; *a* represents the receivers, of which any number may be employed, according to the length or construction of boiler; *b* a copper sphere or ball, which is secured to the top part of the receiver, and is adjusted to its position according to the distance required for working the receivers under the surface of the water; *c* a taper spout, with a communication through it for admitting the pressure internally to the ball, cylinder, or float, in order to prevent collapse; *d* the waste or main receiving pipe, running longitudinally with the boiler, and terminating as required at the front, back, or sides of the boiler, such termination being fitted with a tap, valve, or other suitable contrivance; *e*, *f*, *g*, are vertical pipes, connected to the longitudinal waste or main pipe *d*, in or over which the receivers, *a*, work.

JONES'S IMPROVEMENTS IN THE MANUFACTURE OF LEAD, TIN, &c.

FIG. 1.

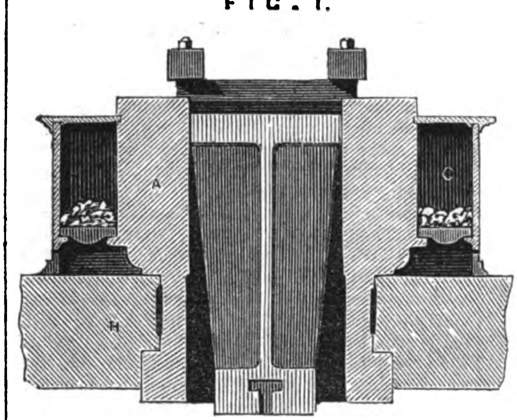
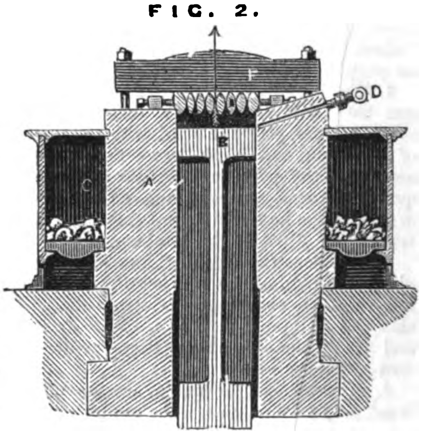


FIG. 2.



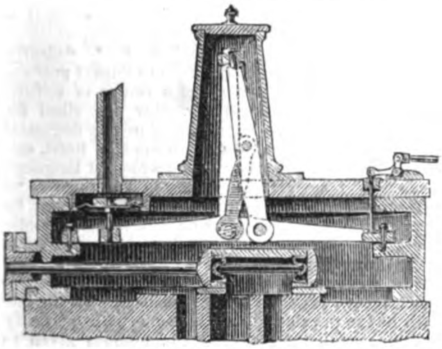
This invention, by Mr. J. Jones, of Liverpool, consists of an improved system for the manufacture of sheets of lead, tin, and other metals, or amalgamation of metals of a like nature, fusible at a low temperature, whereby the sheets can be made of any required thickness or length direct from the metal, or amalgamation of metals, when in a state of fusion, thereby entirely dispensing with the use of rollers, as now commonly practised.

The apparatus consists of a stout cylinder of iron or other suitable metal, heated by surrounding the external vertical side thereof with a fire, or in any other convenient way. This vessel, which is used to contain the molten metal to be converted into sheets, is placed immediately above an hydraulic press, the head of the ram of which forms a piston working within the cylinder, which is used to force out the metal through a die or dies fitted on to the top of the cylinder. These dies may be kept cool by a current or currents of water passing through internal passages formed through them. The sheet or sheets of metal as ejected are received on rollers, and are immediately ready for use. The molten metal for supplying the cylinder is placed above and communicates therewith by a pipe, which is kept heated to cause the metal to flow freely through it. After the piston has forced out the charge contained in the cylinder through the dies, a valve is opened which admits a fresh charge of molten metal from the supply vessel during the down-stroke of the ram, which is again forced out through the forming dies at the upstroke of the ram, as before, and so on until the sheet or sheets have acquired the required length.

In the above engravings, A is a heated vessel for containing the liquid metal to be converted into sheets, and in which works a piston actuated by an hydraulic press placed immediately below; C an enclosed fire-grate surrounding the apparatus, for heating and retaining it at a sufficiently high temperature to keep the metal contained therein in a fluid state; D a valve-plug for closing the orifice used to charge the apparatus with the molten metal, or amalgamation of metals, to be converted into sheets; E the die plates, between the bars of which the metal is forced by the upward action of the piston, the metal becoming solid immediately on coming into contact with the air, where it is received on rollers or in any other convenient way. In some cases, to facilitate the cooling of the sheets of metal, the bars of the die plates are formed hollow, and a current of cold air or water is caused to pass through them, and in some cases a blast or cold air is passed over the die plate and between the sheets of metal as they are delivered from the die. F stout transverse bars bolted to the head of the apparatus for holding the die plates (E) in position; G set screws for regulating the distance between the die bars, which govern the thickness of the sheets to be produced; H the bed plate, upon which the upper portion of the apparatus rests, and which forms the head of the hydraulic press.

A Toulon letter of the 6th states that the building-yards of La Seyne have commenced delivering to the naval authorities the first of the eight iron gun-boats which had been ordered by the State for service in Cochin China. Those small boats, which are made on the most improved model, may be taken to pieces and put together in thirty hours. The machines are of twenty horse-power, and the artillery they carry is one 12-pounder rifled gun in bronze.

BUCHANAN'S SLIDE VALVES.



THIS invention, recently patented by Mr. A. Buchanan, of New Jersey, U.S.A., relates to the combining of the slide valve of a steam engine with a well-known arrangement of mechanism termed the parallel motion, from which it results that the valve is sustained by such mechanism so as to prevent it from being pressed to its seat with a force due to the pressure of the steam, while at the same time it permits the valve to slide back and forth in the required plane, thus greatly reducing the friction and the wear of the surfaces of the valve and valve seat.

The invention also relates to combining with the sliding valve and mechanism, known as the parallel motion, a spring or an equivalent which will yield to the pressure of the steam on the valve, and thereby insure the contact of the face of the valve with its seat, notwithstanding there may be inaccuracies in the parallel motion, and that the parts may wear away and change the adjustments. This yielding property may be contained in the valve itself by making its cover or sides elastic, as represented, or a pressing spring may be applied thereto; or the frame which supports the parallel motion, and is secured to the steam chest in such a manner that it may have a slight play in a vertical direction, is suspended at one end by means of a screw pendent from an elastic diaphragm inserted into the cover of the valve chest. This diaphragm is made of such dimensions that the upward pressure of the steam thereon relieves the valve from a certain portion of the pressure to which it would otherwise be subjected. When it is desired to suspend the action of the diaphragm, steam is let on to its upper surface through a pipe connected with the steam boiler, and which when not used will be closed by a suitable stop-cock.

The invention further relates to the combining with the frame in which the parallel motion mechanism is mounted (and which is contained in the steam chest) a lifting mechanism extending to the outside of the steam chest (consisting of a crank, lever, and rods, or their equivalent) by means of which the valve can be lifted entirely clear of its seat, to prevent the wear of the parts during the working of the engine after the steam has been shut off.

M'INTYRE'S BOMB-SHELLS.

MR. M'INTYRE, of New York, has patented in this country an improvement in bomb-shells and other projectiles, which he describes as follows:—

I cast a hollow case or shell of the size and shape desired with projections from its surface; I then surround this shell with sand, so as to make it the core around which to cast the next shell; and so on. Any number of shells can be formed around each other, the projections sustaining the respective shells firmly in position. These shells are to be filled with powder or inflammable material, so as to explode several times in succession, commencing with the outer casing. To form the shrapnel shell the balls are introduced into the sand forming the core between the inner casing and the next, and are tightly pressed into sand close together, and so remain, after being cast; in other cases, the sand core is shaken out.

M'INTYRE'S BOMB-SHELLS.

FIG. 1.

FIG. 3.

FIG. 2.

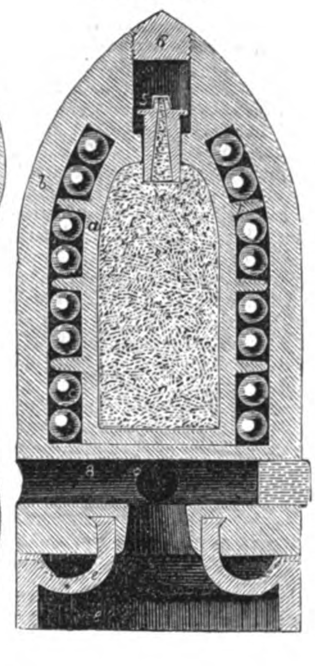


FIG. 6.

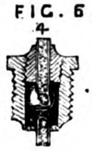


FIG. 5.

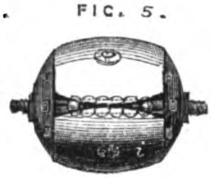


FIG. 4.

My improvements are applicable to globular or to elongated balls or projectiles, and to adapt the same to rifled cannon, I have an expansive metal base corrugated to take the rifling. In order to fire the successive charges I employ a fusee formed by enclosing powder in a lead pipe, and bending the same twice, and compressing the same, and introducing it with sulphur packing into a brass screw cap, so that the confined explosion does not force through this fusee to cause simultaneous explosions. I also employ the same fusee with three or more bombs arranged on an axis, to be rotated and filled within one main bomb. The fusee for the first explosion after being fired may be of any usual kind.

Fig. 1 is a section of a circular bomb with my improvement.
 „ 2 is a vertical section of an elongated shrapnel shell constructed on my plan.
 „ 3 is a globular shrapnel bomb.
 „ 4 is a section of my improvement as applied with grenades in the bomb.
 „ 5 is a side view of said grenades, and
 „ 6 is a section, in larger size, of my improved fusee employed on the inner shells.

Similar marks of reference denote the same parts.

These bomb-shells are to be made of the sizes adapted to fit the various cannon with which they are to be used, and hence in the engraving the various figures may be considered the actual size, or larger or smaller, according to circumstances.

My invention consists in a peculiar manner of casting one shell or casing around another, so that the respective shells are held firmly and correctly in their relative positions. To effect this object I cast the smallest shell first, as at *a*, figs. 1 and 3, and this shell is provided with projections 1, 1, 1. as long as the distance between the one shell and the next; the screw hole for the introduction of the fusee may be cut (as at 2), and then this shell is coated with moulding sand surrounding said projections 1, 1, so as to form the mould around which the next shell (*b*) is to be cast, and so on. Any number of shells may surround each other, and the contraction of the metal in cooling causes the projections 1, 1, to hold the shells firmly to each other and in their correct relative position The sand is easily shaken out after the shells are cast; and in order to introduce balls so as to make the shrapnel fire, I introduce as many balls or pieces of metal as can be pressed into the sand core before casting, hence said balls and pieces of iron are held firmly in place, and the sand surrounding them cannot be shaken out (see figs. 2 and 3); but when the bomb bursts, these balls scatter in every direction with great uniformity. These balls are shown at *c*, *c*, figs. 2 and 3. The various spaces between the shells are to be filled in succession with powder or inflammable material, and a fusee communicating with each causes the same to fire successively, so that there are as many explosions, distinct from each other, as there are charges, and the explosion of the outer charge first throws the shell to a different place each successive explosion.

The first fusee, 3, may be of any ordinary or desired kind, and lighted by the act of firing as usual; but the inner fusees, 4, 4, must be of a different character, because the confining of the explosion would drive the ordinary fusee through, and there would be only one explosion of the separate charges; I therefore form the fusees, as in fig. 6, by taking a piece of fusee in the form of a pipe; I prefer that a small lead pipe be used, and twist the same so that two bends are formed therein; hence a direct line, as in the ordinary fusee, is prevented, and the fire cannot blow through from one charge to the other, but the powder burns the time required, according to the length of fusee. The fusee is to be introduced in the metal screw-cap, as shown, with a packing of sulphur, as at *x*.

The elongated bomb, fig. 2, will be understood in its general construction from the foregoing. I have, however, shown that it is to be fired by a cap on the sliding hammer, 5, that, when the bomb strikes, flies forward with sufficient force to explode it against the screw cap 6. The base of this shrapnel bomb is to have cross holes 8, 8, and I introduce corks in these prior to entering in the gun: I also have a brass or other corrugated metal base *e* attached to the rear end of the bomb, and as the explosion takes place the corrugations are instantly forced out tight against the inside of the cannon to prevent "windage," and the corks in the holes 8, 8, clearing the end of the cannon before the said base *e* are forced out and relieve the pressure, so that the said base *e* is not split

and broken by the action of the gases behind it, and thus the accuracy of the shooting is not impaired by any unequal projection at the back of the ball.

The grenades, *i, i, i,* fig. 4, are attached to the heads 9, 9, with an axis 10; each of these grenades is cast, and the screw for the fusee cut, and the grenades, shown separately in fig. 5, are moulded in the sand together with balls 11, 11, if desired, and then the shell (*a*) is cast around it, and after the sand has been shaken out the grenades can be revolved on their axis, 10, within said shell *a*, by the finger or any instrument introduced through the eye of the shell *a*, and said grenades are charged in succession and fitted with the fusee, 4, 4, and then the whole shell *a* filled with powder, the explosion of which throws the grenades in different directions, and they explode in separate places.

I find that in moulding the balls to form the shrapnel shells, the sand with a small proportion of flour and rosin hold the balls the best in place while the outer shell is cast around; then a small vent-hole should be left for the escape of gases, to be afterwards stopped up. Projections might be made on the insides of the outer shells as well as on the outsides of the inner shells, by moulding in small patterns, or by removing the sand surrounding the shell at places previous to casting.

SERRIN'S APPARATUS FOR STREET LIGHTING BY MEANS OF ELECTRICITY.

Last Tuesday evening Professor Pepper gave an interesting lecture, at the Polytechnic Institution in Regent Street, illustrative of M. V. L. Serrin's apparatus for illuminating streets, &c., by means of the electric light. The inventor was present, and conducted the experiments, all of which were eminently successful, and elicited great applause from a numerous audience. Of course the application of electricity for illuminating purposes is not a new idea or discovery; the difficulty respecting the application of the imponderable has always been, until M. Serrin's invention, to obtain a sustained light. Many years ago the electric light was exhibited; but it was so intermittent, and so liable to pass the spectator from midday brightness to midnight obscurity, that it could not be depended upon. The apparatus invented by M. Serrin is automatic, takes care of itself, and that so well, that, after the battery is charged, the charcoal-points, upon which the light depends, are retained at a calculated distance apart and consumed, the positive to the negative, in the proportion of 22 to 10. To meet the exigencies of this unequal consumption of the charcoal-points, much ingenuity was required. There have been some forty contrivances to produce a sustained electric light; but, until that of M. Serrin, none of them were automatic. The experiments made on Tuesday evening were in every way satisfactory. Wires connected with the battery conducted the light instantaneously to those points of the building where the automatic registers had been fixed. A light was exhibited in one of Defries's prismatic lanterns, supplied for the occasion; another was exhibited through a medium of ground glass. The effect of both was pleasing. To gaze upon the bare electric light is painful to the eye, and would never do for street illumination; but, seen through the media of prisms or ground glass, the eye can behold it with as little discomfort as a candle or gas jet. The bare electric light is penetrative, and may be perceived at many miles distance, which renders it extremely suitable for night signals and telegraphic purposes. The veiled light is not so penetrative, but is more diffused, and, for lighting up cities, more useful. An experiment was made to show how the electric light can be used in an atmosphere of carbonic acid gas, and how even it can be used under water. The latter experiment was perhaps not so decidedly successful as the other, but still it proves that the electric light can be used under water; and if so, it is easy to see what assistance it is likely to be to the diver in his submarine explorations. We shall be able to give more details in a future number. Meanwhile, we may state that M. Serrin has received the medal of the Great Exhibition for his invention, having previously had scientific honours bestowed upon him by various learned bodies and academies of the Continent.

PETROLEUM IN LIVERPOOL.

Petroleum is now being extensively imported into Liverpool, and the attention of the Town Council has been called to the matter, in consequence of certain complaints made by the inhabitants. This week the local functionaries have been engaged in witnessing a series of experiments with the view of testing the combustible properties of petroleum or rock oil, and how it could be most effectually operated upon in case of fire. A temporary brick vault had been erected on some vacant ground in the Police Court, Dale Street, to conduct some of the operations. A cask of Canadian petroleum was first placed in the vault, and after being ignited the fire was extinguished by the application of a fire annihilator; a second cask was also by the same means extinguished, after having burnt for five minutes. A third cask, of thirty-four gallons, was ignited, and when the fire had acquired a certain intensity, two fire-hose were brought into requisition, and a stream of water of considerable power was poured on, which seemed at first to increase, instead of diminish the flames, but in a short time the opposing element conquered. Another experiment was then tried, a barrel of this rock oil being placed on the open ground, and ignited by a train of shavings. On this occasion the oil was allowed to burn for some time, and then an endeavour was made to extinguish it by the agency of water; this, however, was not altogether successful. One of the annihilators was put upon the fire, but could not quench it; but this was afterwards accomplished by water. A barrel of Philadelphia rock oil was then ignited, the barrel being end upwards and laid on the open ground. The flames rose higher than on any preceding experiment, and it was with great difficulty, by the agency of a powerful stream of water, subdued. It is rather singular that none of the barrels should explode, though an opinion was expressed that such an event might be possible.

The result of these experiments has left upon the minds of the town councillors and the other gentlemen who witnessed them, the importance of the question as to the storing of so large a town with such inflammable and dangerous material. It is a serious matter, and one well worth the diligent attention of the public functionaries.

TO CORRESPONDENTS.

Received—L. M. L., W. A., E. F. A., C. B. A., E. M., W. H., Capt. N., W. B., J. B. B., Capt. B., Admiral S., W. T., W. W., J. H. T., Sir J. R., W. V., J. H., W. H. M., Enquirer (no), J. J. W., W. R. T.

Correspondence.

[*We do not hold ourselves responsible for the statements of our Correspondents.*]

THE STRAIGHT LINE *VERSUS* THE WAVE LINE FOR VESSELS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Sir,—As Mr. Moy has now given to his "random remarks," as I think I justly called them, the appearance of an argument, I am afraid it will be thought incumbent on me to refrain no longer from taking notice of them. It is with reluctance, however, I do so, being conscious that I am unworthily occupying the space you can allow me, in assisting anyone in what ought to be the work of self-instruction—his extrication from his own perplexed and tangled ideas. Mr. Moy assumes and presumes too much. He is in a difficulty; he cannot reconcile uniform motion with the action on water of the bow of a vessel moulded with straight lines, and because he cannot himself see any escape from it, he concludes, dismissing all self-reflections, that I am the one who is "profoundly ignorant of the subject" upon which we write. He says that no form of bow will drive the water laterally from a ship's course with uniform velocity, because "the water rising in the form of a bow wave, it is enabled to run down hill towards the sides, which it does at a very irregular velocity" * * * "clearly proving, that the straight line fails to impart uniform motion." In the programme of a course of self-instruction, which doubtless Mr. Moy prescribed for himself, preparatory to his indulging in very dogmatic opinions on such a subject as the one in hand, expressed, as he himself says, "in the strongest language he can use," I am afraid he omitted the theorem of the composition and resolution of forces, and that he skipped an important illustration of it in the parabolic path of a projectile *in vacuo*, where he would have seen an exemplification of a resultant motion compounded from a uniform and an accelerated motion—a case, in fact, parallel, except in causes, with the one which has so puzzled him. Of course it is perfectly compatible with even a variety of motions given to water (among which, doubtless, in actuality are many species of curve lines), that it should at the same time receive either a uniform or an accelerated motion, perpendicular or nearly so to the ship's course, according as her bow is composed of straight or hollow lines; and it is because Mr. Moy does not perceive this, and regards only the actual trajections which the particles of water describe without inquiring into their components, that his advocacy of the wave-line theory amounts, as I have before said, to no more than the throwing out of random inconsiderate remarks, without pertinency or point. I sincerely wish his effort to gainsay this appreciation of it had been successful.

It may perhaps be advisable to append here a few remarks in further explanation, in order to obviate misconception. In the passage of a vessel through water there is an immense amount of motion among its particles, which, though occasioned thereby, is not due immediately to the propulsive action of the bow, and which therefore does not enter as an element into the resistance encountered. The proximate causes thereof are the head of water raised in front and the depression produced at the stern. These give rise to currents and waves, the latter being propagated indefinitely. Now here uniform motion and work (except theoretically in the way of transformation) have no place, and acceleration with momentum under the action of gravity characterise the movements; nor is it to be supposed in regard to the water, which owes its motion primarily to the action of the bow, and contributes to the resistance, that any large portion of it is moved with uniform velocity, for, however convenient it may be to mathematicians to feign that water has the properties of an imaginary discontinuous fluid, such is not the fact. If such, however, were the case, the particles belonging to this particular body of water, being all in a state of isolation, and all being put in motion only by coming into contact with the bow, would all be displaced with uniform velocity. They would now, however, take the character of projectiles, and owe their continued motion to inertia, and would not now be, as in reality they are, the subjects of work—the subjects of continuous pressure, moving only as they are moved, by reason of their opposing a dead resistance instead of that due to their own inertia alone.* The above assumptions of the constitution of water and of the isolated behaviour of its particles, are the postulates of the popular and easy mathematical theory of the subject, and are taken for granted also in the wave-line theory. Let them be admitted, and they peremptorily enforce as a deduction the law of resistance in the exact ratio of the squares of the velocities, and they require it, therefore, to be an inexorably fixed law, and the results determined by it to be invariably certain. But, unfortunately, this mathematical theory and its postulates are not conformable to what we certainly know of the nature and physical constitution of water, nor in regard to the law of resistance is it unfailingly, as it ought to be, in accordance with experimental investigation. There exists, through the influence of pressure and tenacity, or *quasi* viscocity, and other molecular relations, an interaction among the particles of water, and therefore when, because of the acute form of the bow of a vessel, those particles which are in contact with it are coerced into lateral motion, they press upon and urge

* Inertia in this sentence refers in the first instance to that of motion, and in the second to that of rest. And as to *dead* resistance, the contiguity and necessary connection of other particles of water, and the consequent increasing involvement of such in the motion by increase of velocity, are the circumstances which render fluid resistance constant at a given velocity, although such resistance is composed mainly of inertia. And they give to the employment of force, although occupied in conquering inertia alone, the character of *work*, and with as much propriety as when engaged in overcoming friction or gravity.

forward the next, and these again the next, and so on, until the motion is wholly dissipated. It is, accordingly, only the stratum of particles next to a bow (with straight lines) which can be rigorously said to be propelled with a uniform velocity. This stratum is backed up by the resistance of all the others, and this consideration, in connection with the fact that such resistance is constant for the velocity, affords quite sufficient ground on which to base a practical comparative calculation, in terms of the work done, whether as to the case of straight lines or hollow lines, in contradistinction to any *à priori* mathematical deduction from first principles, concerning the impact and resilience of the particles of water, which would involve either a false theory or a problem of impossible solution. We may, indeed, by the more practical method I have adopted, of proceeding by the work done, dismiss from our minds — and, in truth, it would be far better to do so — all consideration of motion in the particles of water, although limited to the first stratum, and regard only the motion of the pressure equivalent to their resultant resistance, whether it be uniform or accelerated, according to the straight or hollow surface of the bow of the vessel. This would put aside all quibbles about the character and direction of the motion of the water, whilst the reasoning as to the respective qualities of the said surfaces would remain precisely the same as before.

I am, sir, yours, &c.,
BENJ. CHEVERTON.

Aug. 11.

MR. CUNNINGHAM'S METHOD OF PROTECTING SCREW-PROPELLERS.

SIR,—The introduction of the mechanical appliance as that patented by Mr. Cunningham, "described in the MECHANICS' MAGAZINE of the 8th inst.," would, if ever adopted, prove to be an additional auxiliary for fouling the screw.

This gentleman must have altogether lost sight of, or forgotten, that there is such a thing existing as sea-weed, which his chain of network would not allow to pass without "permanently" embracing.

The paramount importance of obviating the screw from fouling no one will attempt to dispute; fortunately, however, all such appliances as those patented by Mr. Cunningham can with advantage be dispensed with, simply by constructing screw-propellers with flat circular blades, which would throw off everything coming in contact—an indisputable fact.

Your most obedient servant,
WILLIAM HEWITT.

Bristol, Aug. 8, 1862.

Gossip.

Dr. Robinet has addressed a curious communication on the congelation of water to the Academy of Medicine. It is well known that the blocks of ice formed in the sea yield fresh water by liquefaction. When sea-water or any saline dissolution is congealed, the pure water is separated in the form of ice, and there remains a concentrated watery solution of the saline matter. It is thus salt is economically obtained in the north of Europe. To increase the alcoholic strength of wine it may be subjected to artificial cold, whereby the water alone which it contains is congealed and the wine becomes richer in alcohol. By operating in a similar manner on potable water Dr. Robinet has found that it loses nearly all its salts, whether soluble or not. The waters of the lake of the Bois de Boulogne having been subjected to the operation, the small quantity of calcareous and magnesian salts they contained were eliminated. The purity of the water obtained by this method is such that it may in many cases be used instead of distilled water.

A prospectus has been issued of the Spring Creek Copper Mining Company of South Australia, with a capital of 100,000*l*., in shares of 5*l*. The object is to work the Spring Creek Mine, near Port Augusta, which is a recent discovery. Very flattering statements have been made respecting the richness of the mine.

The British and Foreign Railway Plant Company (limited) has been launched for the purpose of supplying railway plant and stock, both fixed and movable, of every description, for British or foreign railways, both in the way of selling, leasing, and hiring. Both in England and Belgium a number of companies of a similar character are already in profitable operation. The first issue of capital is to consist of 100,000*l*., in 20*l*. shares.

The South Eastern Railway Company have recently added another steamer to their fleet, the Albert Edward. At the trial trip, on the 26th ult., she attained between 16 and 17 knots an hour. She performed the passage between Folkestone, on Tuesday week, a distance of 26 miles, in 93 minutes. This was done with 330 passengers on board, and with a strong south-west wind blowing.

A French company has been formed in Paris, with a capital of 1,000,000*l*., for the cultivation of cotton in Algeria. The company also propose to cultivate other crops, such as corn, olives, vines, tobacco, and flax; and will further breed cattle on a large scale, and likewise propagate the rearing of silkworms, cochineal, and other valuable produce. The land proposed to be cultivated by the company comprises a surface of nearly 26,000 acres.

Mr. W. Bertram, of 26 Guildford Road, Greenwich, writes to say that he took out a patent similar to that ascribed to Mr. Robert Aytoun, in Civilian's letter, on the 18th ult.

In the construction of the Bulah Viaduct, four miles from the town of Brough, in Westmoreland, an ingenious and novel mode of erection was adopted by the contractors, Messrs. Gilkes, Wilson, & Co. They used no scaffold, but having commenced the erection of the first pier from the abutment on the Brough side of the valley, by means of a crane with a gib extending from the abutment, they swung each piece of the iron work of the pier by counterbalancing it with a shifting weight-box as it swung, and thus were enabled to lower it steadily to its place. When the first pier was erected they placed two bulks across from the abutment to the pier, and ran the girder over, dropping it into its place with the assistance of the crane. On the completion of the first span the crane was moved forward, and the other piers were erected and connected by girders in the same manner. By this mode of erection the viaduct was completed in the almost unprecedentedly short time of four months.

We have just heard of a most liberal offer having been made to the Lancashire Relief Fund by an American gentleman (which, of course, was immediately accepted) of the whole profits, equal to 10*s*. upon each article sold, of some most useful household inventions, until the close of the Exhibition in October, and which are shown and explained in the American Department of the International Exhibition daily. This is as it should be, and clearly proves that amongst the better class of Americans the angry feelings expressed by the New York Press do not find a place. From what we are given to understand of the nature and usefulness of the inventions, and their popularity in the United States, where upwards of 20,000 have been sold within a few months, in spite of war, we think it probable that not less than 10,000*l*. will be realised from this source for the Fund!

A Glasgow correspondent says:—"I may remark on the peculiar award to R. Napier & Sons, alluded to in your article last week. It is for drawings and for engines of the Persia shown in the drawings. Now, it is a positive fact that Messrs. Napier did not exhibit any drawings containing the Persia's engines. What they did exhibit was, a drawing of some gunboat engines. Mr. D. Kirdaldy (lately with them) exhibited, on his own account, his beautiful drawing of the Persia in Class XII., and most deservedly got a medal (i.e. one besides that awarded to Messrs. Napier). Mr. K. had a photograph of his drawing of the Persia, beside the gunboat drawing; which may have led to the mistake. I perfectly agree with you that the Persia's engines did not merit a medal — unless it might be for 'workmanship,' which could not be shown in the drawings. It is here a common opinion that it would have been better had there not been awards of medals," &c.

The projected fortifications for the defence of the Bristol Channel and the estuary of the Severn are at once to be erected. On the English side of the Channel, a heavy battery will be erected on the extreme western point of Break Dorvin, a promontory which runs out a considerable distance into the Channel, having a high elevation throughout; the second edifice will be batteries on each side of the Steep Holmes; the third, similar batteries on both sides of the Flat Holmes; and the fourth defence a fort mounting heavy ordnance at Lavernock Point, a promontory just below Penarth Roads. It is said that between these defences a very formidable cross-fire could be maintained. In no case would the ordnance be required to command a greater range than 2,000 yards.

An official report, just published, relative to the inundation of the Middle Level, says, that though these occurrences are rare, they have been found beneficial to the crops in succeeding years. The expenses incident to the disaster already paid and incurred are estimated at from 23,000*l*. to 25,000*l*.; but the past, present, and prospective damages cannot be definitively settled; but the commissioners have determined on exercising their loan powers to the further extent of 40,000*l*. In reference to the future drainage of the Level, Mr. Hawkshaw, C.E., has recommended that for the next twelve or eighteen months, in addition to such drainage as can be obtained through Salter's lode sluice, siphon-pipes should be laid over the recently-constructed coffer-dam, and that nothing should be done as to the erection of a new sluice until the siphons have been fairly tried. The expense of fifteen siphons, with air-pumps, steam-engine, and necessary apparatus, is estimated at from 13,000*l*. to 14,000*l*. Six siphons only have at present been ordered by the engineer, and are expected to be shortly fixed. The necessary legal powers to enable the commissioners to provide for the temporary drainage and for the site of a new sluice or other works, have been obtained by clauses in the Middle Level Drainage Act, passed in the Session which has just closed. On the suggestion and recommendation of Mr. Hawkshaw, Mr. A. G. Lynn has been appointed resident engineer of the works for one year, at a salary of 1,000*l*., as Mr. Hawkshaw has heavy and important works under his charge, both at home and abroad, and will probably not be in England during the autumn. Mr. T. E. Harrison, of the North-Eastern Railway, has also been associated with Mr. Hawkshaw as consulting engineer to the commissioners. It may be added that the fifteen siphons proposed to be erected will have a diameter of 3ft. 6in. each, which will give the water the same scope as it had in the three openings of the ruined sluice.

The experiments at Shoeburyness with shot against iron targets have developed some curious results. The appearance of a conical iron shot after having struck the iron target is like that of a birch broom hollowed in the centre. When the point of the cone strikes the target it is stopped, but the surrounding portions of the shot move forward and slide over the centre as a cone, and thus produce the form described.

A proposal has been made to provide a park for the northern district of the metropolis by the aid of a joint-stock company. An estate of about 450 acres has been secured, and about 200 acres of which are to be set apart for a park, gardens, and ornamental grounds. The surplus land will be let off for building purposes. We need scarcely say we wish the project will issue in a satisfactory realization.

On Friday last the Adriatic, belonging to the Atlantic Royal Mail Company, left the Southampton Docks for an official trial trip, in the presence of the Government contractors. Her saloons are capacious and splendidly fitted up. Her length is 354ft., breadth 50 feet, tonnage 3,700 and 1,300 horse power. The engines are on the diagonal oscillating principle. Cylinders 1,000½ in. in diameter, with 12 ft. stroke piston; diameter of paddle wheel, 41 ft. Her speed was tested at the measured mile in Stoke's Bay. The special objects of the trip were to ascertain the working of her machinery, and the speed attainable under steam only, which averaged in the four runs 14,081, or about 16 statute miles per hour. Pressure of steam, 24lb; revolutions of engines, 15; vacuum, 29; on board 850 tons of coals, 55 tons of water; the draft of water aft, 20 feet, forward, 19ft. 4in. The results of the trial, although blowing a hard gale from the south-west throughout the day, with heavy squalls of rain, must have been highly satisfactory.

The Butterly Company's Codnor Park Iron Works, near Alfreton, Derbyshire, have recently rolled one of the largest wrought-iron plates ever made. Its dimensions are 42ft. long by 7ft. 2in. wide in the middle, and 4ft. 10in. at the ends by 2in. thick, containing 252 superficial feet, and weighing 9 tons. The largest plate in the Exhibition is from these works, containing 163 square feet, being 89ft. less than the above. The process of heating and rolling this giant plate has been successfully executed. Two of these plates are now rolled; they are for a beam pumping engine of 84-inch cylinder, 10ft. stroke, and upwards of 300 horse-power, which is being manufactured at the Butterly Iron Works, near Alfreton, for the Clay Cross Colliery Company.

Mr. Ross, C.E., who was connected with some of the earliest and largest railway works in this country, but more recently with railway enterprises in Canada, where he constructed the great bridge over the St. Lawrence, at Montreal, died on Friday last, at Kensington, aged 58.

A letter from Toulon of July 29, published in the *Gazette du Midi*, states that a naval commission assembled on the previous day on board the iron-cased frigate Gloire to prepare a report on the effect of the apparatus applied to her machinery to increase the power of her steam. The success was decisive; the Gloire, having but half her fires lighted, obtained an increase of mechanical force equal to 30 per cent. This invention will be of immense importance with respect to iron-cased ships, as they cannot carry as much fuel as ordinary ships. The experiment tried on board the Gloire proves that henceforth ships of her class may proceed to sea with less fuel and obtain a greater speed than under the old system. It is proposed to apply this apparatus to all steam-vessels in the French Imperial navy.

Mr. Barnet Blake has suggested, in order to carry out recreations for the members of Mechanics' Institutes during the summer months, that they should consist of cricket, bowls, quoits, foot-races, and other amusements in the open air. If the tastes of the members should be of a more intellectual or scientific character, he advises the carrying out of excursions, for the practical study of botany, geology, entomology, landscape sketching, architecture, antiquities, &c. He also suggests occasional cheap railway trips, visits to museums, &c. Respecting the latter, he says that local museums more commonly fail from the want of an intelligent guide, than from disregard to the information they may afford; and if gentlemen who possessed the ability would undertake to give short explanatory discourses, either in museums or similar objects of interest, to classes of working men from Institutes, many a delightful source of recreation, he thinks, might be gained.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

The Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

209. W. Orr. *Improvements in the machinery or apparatus for the manufacture of sugar.* Dated Jan. 27, 1862.

This relates to the "blowing up" of sugar; and the apparatus consists of an open vessel, by preference of a rectangular or circular figure, about 12 ft. by 5, and 4 ft. deep. This vessel is made with curved or sloping ends extending to the bottom. The vessel is constructed with the usual double casing for heating it by steam, or by a heating pipe inside; it is also provided with steam pipes for conveying the steam into the open vessel if required. One of these steam pipes is so arranged as to convey the steam to the lower part of the blow-up to adapt it to the heating of a comparatively small quantity of fluid, whilst the other pipe opens into the blow-up at the upper part. Extending across the blow-up is a horizontal shaft carrying a fast and loose pulley, which is driven from contiguous motive power. This shaft has fitted to it a wheel with floats, similar to an ordinary paddle-wheel; these floats are arranged to shift up and down, so that they may be adjusted to the depth of the liquor in the blow-up. Each float-board of the wheel is provided with a series of adjustable knives or cutters, which are fastened by screws to the floats. As the wheel rotates, the knives divide the lumps of sugar in the liquor, whilst the float-boards put the whole of the fluid into rapid motion by impelling it towards one end of the blow-up, from whence it passes down and along the bottom of the vessel, ascending at the other end. In this way a continuous rotatory current is kept up, and any deposition of the sugar in the blow-up is prevented. *Patent completed.*

210. J. Smith. *Improvements in the construction of covered rollers used in machinery for preparing, roving, spinning, twisting, and doubling fibrous materials.* Dated Jan. 27, 1862.

Here it is proposed to use an iron boss or collar of a peculiar make, the periphery of which is formed conical, or any other shape suitable to cause the expansion of a slit or cut ring, which the inventor terms an expansion ring. This ring is made by hand, or otherwise, and while in this contracted state the cloth and leather covering is placed thereon. It is then placed on the conical or shaped periphery of the boss or roller, which causes the expansion of the ring, and stretches the covering to its full extent. The ring is forced on, and secured in its place by a plate or follower, forced up by a nut screwed on to a thread formed on the end of the pap or bub of the roller. The edges of the covering are further secured by grooves cut in the inner faces of the follower and roller, against the edge of which, as the ring is expanded, the edges of the leather covering are pressed, and thus the edges of the covering are concealed, and a very neat appearance given to the roller when finished. *Patent abandoned.*

211. W. W. Warren. *The purpose of preventing the desecration of the dead, for sanitary purposes, and providing a cheap and inexpensive mode of interment.* Dated Jan. 27, 1862.

This consists in a new application of certain incorporated and adhesive substances, to be used either with or without iron or tiles, for covering coffins, sarcophagi, or other modes of interment, by filling in wholly or partially graves or vaults in which the bodies of deceased persons are entombed by a combination of materials composed of cement, lime, asphaltum, or any other setting or binding mineral cement, in conjunction with ballast, gravel, burnt clay, or other siliceous matter, incorporated so as not to destroy their adhesive setting or binding properties. *Patent abandoned.*

212. T. J. Robotham and N. Hackney. *Improvements in purifying slip, glaze, and other potters' materials.* Dated Jan. 27, 1862.

This consists in causing the slip, glaze, or other potters' materials to pass through a box divided into compartments by partitions, in one end of each of which partitions, holes, or passages are so formed that the materials being fed into a compartment at one end of the box may pass successively through each of the compartments, and the passages are formed at alternate ends of the partitions, so that the materials are caused to pass from end to end of each compartment, and the materials pass away from the bottom of the last compartment through a pipe, in which is a tap to regulate the flow of the materials. In each compartment are placed two or more "horse shoe" electro-magnets, and the magnets are placed so that their poles alternate, and the magnets in all the compartments are worked from one battery, the wires from like poles of the magnets being connected together. *Patent abandoned.*

213. J. List. *Obtaining distances and heights, and distances between distant objects, without computation.* Dated Jan. 28, 1862.

This consists of an instrument made of wood and brass, with hinges to fold into a suitable size for carrying in the pocket. It is opened out in the form of a square, and is provided with two small foresights and a backsight hinged to a movable slide; a stand with a socket connects it to a rifle when piled, or to a common tripod for taking the quantity of an angle. A line of tangent divisions is marked on the sliding part, and also above it on the fixed part; on the other, or lower part, there are proportional divisions, with numbers to indicate at sight the distance of an object. A table of figures is also given to indicate the height or distance between two objects at a distance according to the number of degrees and minutes subtended in the observation; an extended scale is also provided to show more accurately the long distances. *Patent abandoned.*

214. H. H. Treppas. *Improvements in the construction, use, and employment of the kaleidoscope, whereby the images may be secured, copied, or photographed, greatly to the benefit of science, trade, and the arts (to be called "the rilievo-dioscope").* Dated Jan. 28, 1862.

This consists of an object box, which is an open one, allowing the objects to be changed or arranged by the fingers or otherwise. Between the reflecting tube and the object box perforated slides of pasteboard or other material may be made to carry lace or other tissues or fabrics with them, or may be filled with coloured glass, &c., made to pass backwards or forwards wherewith to vary the images. *Patent completed.*

215. S. Smith and T. Smith. *Improvements in the manufacture of cord and twine from mill-spun yarns.* Dated Jan. 28, 1862.

This consists in the making up or manufacturing of cord and twine from mill-spun yarns. These yarns the inventors "toss up," by the fore and after turn in the single threads, by which they produce a more uniform and superior article at a less cost. *Patent abandoned.*

216. J. Haukins. *A new composition or wash to be applied to marine and other steam boilers, to prevent incrustation.* Dated Jan. 28, 1862.

This composition or wash is formed of the following ingredients mixed in manner hereafter stated. The inventor takes spirit of salts (hydrochloric acid) and adds potash and soap makers' alkali. He then adds zinc and continues adding it until the acid becomes neutralised, or until it ceases to boil or effervesce; he allows it to cool and settle, and then decants the clear liquid. This liquid applied with a brush in the interior of boilers effectually prevents incrustation, and at the same time preserves the boilers. *Patent abandoned.*

217. J. Hunt. *An improvement or improvements in the manufacture of gas and other chandeliers.* Dated Jan. 28, 1862.

Here the patentee takes a series of square or angular tubes, and bends them into such forms that when they are symmetrically arranged about a common axis, they form a skeleton or framing of the general figure which it is intended the chandelier shall have. The tubes are fixed together by screwing, brazing, or otherwise, and the chandelier is finished by the addition of ornaments. *Patent completed.*

218. M. A. F. Mennons. *Improvements in engines actuated by heated air or by combinations of air and steam.* (A communication.) Dated Jan. 28, 1862.

The essential feature here is the conversion of the separate pump and driving cylinders into a single body, in which are exerted at the same time the suction and forcing of the cold air supplied to the furnace, and the working power of the heated air proceeding therefrom. *Patent completed.*

219. M. A. F. Mennons. *Improvements in the construction of looms for weaving.* (A communication.) Dated Jan. 28, 1862.

This invention is not described apart from the drawings. *Patent completed.*

220. A. H. Church. *Improvements in the means of preserving stone, brick, slate, wood, cement, stucco, plaster, whitewash, and colour-wash, from the injurious action of atmospheric and other influences; also in the application of colours to the surfaces of stone, brick, slate, wood, cement, stucco, mortar, clay, plaster of paris, plaster, whitewash, and colour-wash; and in the retention of such colours thereon.* Dated Jan. 28, 1862.

The patentee claims: 1. The exclusive use of a solution of silica in water, when preceded or followed by a solution of baryta or strontia in water, that is to say, the successive or consecutive use of such solutions as applied to any of the recited purposes of the invention, according to the processes and after the manner described. 2. The exclusive use of the mixture of a solution of silicate of potash or soda with sulphuric, hydrochloric, or other common and suitable acid (and which mixture may be regarded as an impure solution of silica), preceded or followed by a solution of baryta or strontia, as applied to any of the purposes of the invention. *Patent completed.*

221. C. Culling. *Improvements in fire-arms.* Dated Jan. 28, 1862.

Here a projection is fitted by preference on the under side of the stock, and behind the trigger guard; this projection is formed on a lever or instrument, and is so arranged as to be acted on and pressed inwards by the hand when grasping the stock, and there is a catch or bolt which prevents the trigger releasing the hammer till such catch or bolt is moved away: this is done by the lever on which the projection is formed when it is pressed inwards. There is also another apparatus used which is acted on by pressing the butt end of the fire-arm against the shoulder; this arrangement consists of a sliding rod within the stock, the outer end of which has a button or enlargement upon it which extends somewhat beyond the heel plate, so that the rod is moved inwards when the butt is pressed against the shoulder. The inner end of the rod is arranged to act on another catch or stop, which prevents the trigger acting till it is moved away, and the two apparatus above explained are so combined that the rod of the latter cannot be moved inwards until the projection of the former is depressed, the lever on which the projection is mounted also locking the rod of the second apparatus. *Patent abandoned.*

222. S. C. Liston and J. Warburton. *Improvements in preparing cotton for spinning.* Dated Jan. 28, 1862.

According to this invention, cotton is first passed through a scutching, beating, or other machine, acting in like manner to knock out the dirt, and to open the fibre; but in place of making the laps of cotton by such machines suitable for a carding engine, they are made of proper width and thickness for a combing machine. The cotton is then either taken directly to a combing machine and combed, or before being combed it is subjected to a screw gill or other drawing machine and then combed. *Patent completed.*

223. C. H. and E. Morgen. *Improvements in carriages.* Dated Jan. 28, 1862.

The peculiarity of this consists in arranging the apparatus by which the head of the carriage is opened and closed so that the coachman or other person on the driving seat may, by pressing a lever or suitable instrument, cause the head or the parts of the head of a carriage to open and shut. *Patent completed.*

224. G. Chapman. *Improvements in rotating circular knitting frames.* Dated Jan. 28, 1862.

This consists in applying to circular rotating knitting frames apparatus suitable for doubling yarns or threads, at the same time that the knitting machinery is producing its work, and for delivering such doubled thread to the needles of the knitting frame. *Patent abandoned.*

225. G. I. N. de Ridder. *Improvements in railway carriages for the conveyance of travellers and goods.* Dated Jan. 28, 1862.

This consists, 1, in constructing the main framing of T or I shaped or other suitable girder-sectioned wrought iron beams, in lieu of timber beams. The longitudinal beams or framing may be either straight or curved edgeways over the axle bearings, the chief object of the latter form being to enable much larger running wheels to be used in vehicles of this description than has before been found practicable, say from 4½ to 6 feet in diameter, whereby the draught is greatly facilitated. The floor of the carriage when supported on these large wheels, is raised at the parts immediately above the axles, and the upper half of each wheel is enclosed in a box or casing formed in the interior of the carriage or wagon. 2, in the application of an oil reservoir to the journal of the axle, so that the journal shall always be entirely immersed in oil. *Patent abandoned.*

226. W. E. Newton. *Improvements in engines to be employed for pumping or forcing air or water, or for other purposes where a rectilinear motion is required.* (A communication.) Dated Jan. 28, 1862.

This invention consists mainly in a mode of arranging and working the valve gear of the steam cylinders, whereby when one piston is at mid or half stroke, the other piston shall be at the end of its stroke. *Patent completed.*

227. W. Irlam. *Improvements in the construction of railway crossings and turntables.* Dated Jan. 28, 1862.

This invention is not described apart from the drawings. *Patent abandoned.*

228. R. Bodmer and W. Wilson. *Improvements in the process of manufacturing artificial stones, parts of which improvements are also applicable to the manufacture of artificial fuel.* Dated Jan. 28, 1862.

The patentees claim, 1, the application and use of sal ammoniac, or other salts of ammonia, in the manufacture of artificial stone or bricks, made according to the process described in the specification of L. D. Owen's patent (No. 1,270), dated the 28th day of May, 1856. 2. The manufacture and

use of artificial stones or bricks entirely of hydraulic or other limes, or of a combination of different varieties of lime, for the purposes described. 3. The manufacture and use of artificial stones or bricks of a black or dark colour, either for building purposes or for fuel, as described. 4. The application and use of sal ammoniac, or other salts of ammonia, in the manufacture of artificial stones or bricks, made entirely of hydraulic or other limes, or of a combination of different varieties of lime, or in the composition of which natural or artificial calcareous cements are employed. *Patent completed.*

229. J. H. BRIERLY. *A clasp or fastener for reversible belts, bands, or straps.* Dated Jan. 29, 1862.

In carrying out the invention the patentee employs two plates of metal, or any other material similar to those used for the clasp, generally understood by those connected with the trade as a double clasp, which consists of two clasps connected together, when worn on the person, by a hook on the one and an eye on the other. To the back of each plate of metal or other material he attaches a metal wire bar of suitable width; he also further forms out of the plate of metal or other material, or attaches to it, two hooks, one on each side, the part usually having but one, but so arranged that neither of the hooks can be seen when worn on the person; to the other plate of metal or other material, or part of the double clasp usually containing the eye or slot, he attaches a projecting piece of metal, having a groove or slot cut or formed in it for the purpose of receiving a sliding bar, wider at each end than in the centre portion, and having an eye at each end so formed that the eye will receive either of the hooks attached to the other portion of the clasp, so that, by moving the sliding bar, the double reversible clasp may be connected from either side at pleasure, and, having attached the double reversible clasp to a belt, band, or strap, made of leather and silk on the one side and leather only on the other side, the belt, band, or strap may be connected and worn either side outwards, according to the wearer's choice. *Patent completed.*

230. T. CLAYTON and W. SMITH. *An improved flyer.* Dated Jan. 29, 1862.

According to this invention, instead of the yarn being guided through the tube of the flyer direct on to the bobbin, the inventors guide it to the bottom of one arm of the flyer, so that it will be wound on the bobbin more evenly, and prevent snarls, so common on the ordinary plan. They accomplish this object by fixing a washer on the top of the flyer, and a cross piece on the top of the tube, with a guide or guides. *Patent abandoned.*

231. T. D. DE BOUTTEVILLE. *Improvements in machinery applicable to the spinning of fibrous substances.* Dated Jan. 29, 1862.

This invention has for its object the prevention of the loss of time consequent upon stopping the ordinary drawing and doubling machine for the purpose of changing the can when the machine is driven at great speed. For this purpose the head of the machine is similar to that in ordinary machines, except that, instead of being fixed as usual, it is capable of being turned on a pivot, when one of the cases is full, either from right to left or from left to right, according to its position over the empty can, which is at the side of the full can, and turns in the same direction with it. The movement of the head is controlled by a stop in such a manner that no time is lost in the taking up and delivery of the cotton or other fibrous substance. This stop, pressed upon by a spring, holds the head sometimes to the right, sometimes to the left, but it is raised at the required moment for changing the can by means of a bent lever, when the head is pushed into the position required. *Patent completed.*

232. L. A. PULVE. *Improvements in fireproof iron chests and strong boxes.* Dated Jan. 29, 1862.

These improved iron chests or safes will be composed of a double casing on all sides. Each side of the first casing will be formed of two sheets of iron, with counter-sunk rivets on to an iron framing, the thickness of which will be regulated by the space which it is desired to reserve between the two sheets of iron. The outer door which closes the safe will precisely resemble the sides, and will turn on a pivot top and bottom. To preserve the chest, and make it fireproof, the inventor proposes to introduce between the two sheets of iron a fireproof body, composed of very refractory siliceous sand; and to strengthen it, he proposes to place fillets or bands of iron on all the outer angles of the chest. The inner casing will be constructed in the same manner, and of similar material as the outer, the space left between the two sheets of iron being the same, but, in this case, stuffed full of raw wool, which will render the interior still more inaccessible to heat. *Patent abandoned.*

233. J. M'KEAN and J. GARBOTT. *Improvements in sizing or dressing yarn or textile materials.* Dated Jan. 29, 1862.

This invention relates to the application or the employment and use of a new composition to be used for what is technically known as sizing, or dressing and preparing warp-yarns for the loom, so as to enable such warp-yarns to undergo the process of weaving. The basis of the new composition consists of luminous and siliceous earths and compounds, such, for example, as that known as kaolin, or china clay, or any suitable siliceous or aluminous matter, mixed with certain mucilaginous and glutinous extracts obtained from materials such as linseed and the refuse clippings of hides. *Patent completed.*

234. T. MERITON. *Improvements in marine and other boilers for generating steam.* Dated Jan. 29, 1862.

This invention consists, chiefly, in so constructing these boilers that the patentee is enabled to introduce at the back of the fire-grate, in the part usually known as the "up-take," a series of vertical or inclined tubes, of a circular, oval, or any other convenient form, connecting the water space at the top of the boiler with the water space at the bottom of the boiler, behind the bridge at the back of the grate, and thereby materially increasing the heating surface, and the consequent evaporative efficiency of the steam-boiler. At the same time, by the improved arrangement he is enabled to render all the tubes and parts of the boiler more accessible for the purpose of repairs and cleaning or clearing operations than any other form of boiler hitherto used. The important advantages of these improvements are the facility with which boilers constructed upon this principle may be thoroughly repaired, and the parts most subject to wear renewed, without laying up the vessel for any length of time, as is necessitated with all other descriptions of boilers in use. *Patent completed.*

235. W. CLARK. *Improvements in the disintegration and bleaching of textile materials for the manufacture of paper.* (A communication.) Dated Jan. 29, 1862.

The improved process, the subject of this invention, requires but an almost inappreciable extra expense of working, as all existing manufacturers may be employed for the production of a white paper from all kinds of straw. The patentee employs straw prepared as in ordinary in the manufacture of wrapping or brown paper from straw, which consists in steeping the straw in a bath of lime water. After this is withdrawn, it is allowed to ferment, or, better still, it is heated by a jet of steam. He then takes the straw, after treatment in the lime bath, and disintegrates it by passing it between crushing cylinders. After this he places it in a vat, furnished at the lower part with a false bottom of wood, covered with a layer of straw or broom, which will allow of the filtration of the bleaching waters. One or more cocks are placed at the bottom of the vat, of different sizes for regulating the flow of the liquids. The vat being filled, he allows the matters to drip, and he then waters it sufficiently on the top by a rose or other distributor, with water acidulated with sulphuric acid, marking about one degree. *Patent completed.*

236. J. B. HARBY. *Improvements in preserving electric telegraph cables and wire.* Dated Jan. 29, 1862.

This invention consists in impregnating or coating the yarn or textile fabric or fibres employed in the manufacture of electric telegraph cables with a composition of solution of caoutchouc, resin, and powdered chalk, the proportions of the materials being varied according to the pliability required when the composition is set. In some cases the patentee mixes with the composition arsenic or other poison, to guard against the attacks of fish, insects, and animals. The invention also consists in coating the conducting wires, whether in submarine, subterranean, or suspended telegraphs, as also complete cables and the separate wires composing the cable, with the said composition, which he applies in a heated state. The suitable proportions of the materials forming the composition are as follow. — caoutchouc 1 part, resin $3\frac{1}{4}$ parts, chalk $3\frac{1}{4}$ parts, arsenic $\frac{1}{10}$th part. *Patent completed.*

237. R. A. BROOMAN. *Improvements in machinery for puddling metal.* (A communication.) Dated Jan. 29, 1862.

The object of this invention is the substitution of mechanical for manual power for stirring up the metal submitted to the action of the fire in reverberatory furnaces. The invention, as applied to the puddling of iron, is as follows:— The machinery employed is intended to stir up the metal at the bottom of the furnace by means of tools such as puddlers, stirrers, and other equivalent instruments introduced into the furnace through openings formed in the most suitable parts of the furnace. The tool is worked in all parts of the metal in quite as varied a manner as if by the hands of a workman. The speed of the tool is regulated at the will of the attendant, by shifting the driving-band on the driving pulleys of the machine (also its position and the direction of the oscillations on the surface of the bed) so that the puddling is not only effected without labour, but in less time than in the ordinary manner. *Patent abandoned.*

238. B. FOSTER. *Improvements in machinery or apparatus for spinning and doubling wool and other fibrous materials.* Dated Jan. 29, 1862.

This invention relates to those spinning and doubling machines in which a cap or bell is employed, and has for its object the prevention of snarls. For this purpose the patentee connects levers or similar apparatus to the bobbins, whereby they may be raised so as to cause them to pass into the caps or bells of these levers, or other such apparatus are combined with that commonly employed for shifting the driving strap, so that the two operations may be effected simultaneously. *Patent completed.*

239. W. E. NEWTON. *Improvements in printing machinery.* (A communication.) Dated Jan. 29, 1862.

This invention of improvements in printing machinery relates: 1. To improvements in that description of printing machinery in which the type or printing surface is curved for the purpose of being secured on a cylinder or curved surface. 2. To improvements in printing machinery in which the type or printing surface is flat, as in the ordinary forms. The first improvement relates to an improved mode of securing stereotype plates or other analogous printing surfaces on the type cylinders or rollers of rotary printing machines. For this purpose, stereotype castings of type have heretofore been mounted on wooden or other blocks, and secured in iron frames, forms, or chases, which were fastened in any convenient manner on to the type cylinder or roller. The present improvement is adapted for securing stereotype plates, or any other solid printing plate or surface, on the type cylinder, and consists in attaching or securing the stereotype or other plate or printing surface direct on the cylinder by means of strong metal fingers or cramps, the stems of which are screwed and pass through holes made in the face of the cylinder, and are secured and held down from behind by means of fly nuts, thumb screws, or other equivalent contrivance. By this means the blocks and iron frames for holding the stereotype plates are dispensed with. The second improvement relates to a novel construction of perfecting machine. In this machine there are two impression cylinders, and two type cylinders, with the necessary inking arrangements adapted to each type cylinder. There are also two feeding boards, on each of which is placed a pile of paper ready to be fed into the machine in the ordinary manner by the feeding boys, who push the paper down sheet by sheet to a gauge point, and place the edge or margin of the sheet under carrying in rollers, which descend alternately and take hold of the paper and conduct it in between a pair of feeding rollers provided with tapes, which carry the sheets to be printed down to the impression cylinders. *Patent completed.*

240. W. E. NEWTON. *Improvements in the boxes for the journals of railroad carriages and other axles.* (A communication.) Dated Jan. 29, 1862.

This invention consists: 1. In providing in journal boxes an endless revolving belt or ring for the purpose of sustaining the weight bearing on railroad carriage axles, and reducing the friction on the axles produced by the weight supported, and likewise for elevating the lubricating or cooling material, which may be water or other liquid, from the bottom of the journal box to the upper side of the axle journal, and further, under certain circumstances, for the purpose of forming a spring cushion above the axle journals. 2. It consists in supporting in the journal box the endless belt or ring by means of a combination of a pin sleeve and sheave, or simply by means of a series of friction rollers or balls interposed between the shell of the journal box and the belt or ring. 3. It consists in the employment of an auxiliary box for steadying the end of the journal sidewise and endwise, and also for lubricating the end of the journal. 4. It consists in making the journal box with a longitudinal partition, and thus forming a separate chamber for containing the lubricating material and cotton waste which lubricates the axial pin of the sheave. *Patent completed.*

241. G. BEDSON. *Improvements in wire fences.* Dated Jan. 29, 1862.

This invention consists in so forming and adjusting wire fences that their section taken vertically shall be greater than that taken horizontally, and the inventor therefore uses flat or oval wire either in simple or combined strands. *Patent abandoned.*

242. M. COLLIER. *Improvements in looms for weaving.* Dated Jan. 29, 1862.

This invention is not described apart from the drawings. *Patent completed.*

243. G. and G. PHILLIPS. *Improvements in the distillation and rectification of alcohols or spirits.* Dated Jan. 30, 1862.

This consists in the filtration of the vapour of alcohol or spirit by passing it through wire gauze, perforated sheets of metal, shavings, filings, or pellets of metal, fibres of silk, cotton, wool, &c., arranged so as to have fine openings or passages through which the vapour of alcohol can pass, but not its impurities. *Patent completed.*

244. M. ALLEN. *Improvements in the construction of buildings for the prevention of fire, and in the materials to be employed therein and therefor.* Dated Jan. 30, 1862.

Here the patentee economises the space which the staircases usually occupy, and renders the building fireproof by dividing or insulating the staircases from the building of which they form a part. He forms a material for building purposes by the combination of cinders, slags, cokes, culm, clinkers, or other calcined substances of similar character, with Portland or other cement. *Patent completed.*

245. J. GOUTARD. *Improved truss plates, producing an upward pressure.* Dated Jan. 30, 1862.

This consists in a mode of fitting the metallic plate, on which is fixed the cushion intended to squeeze the hernia. The said plate is made of steel, and in two parts, which are joined together as a hinge; the flattened end of the hinge peg is fastened to the usual curled spring girdling the body. Both parts of the plate have corresponding notches cut in the hinge part, and a small fluted cylinder, fixed by a pin on the hinge peg, is lodged in the notches. On one of the two parts of the metallic plate a small tempered steel plate is fastened, either by a screw or rivet; the end of the said blade enters the fluting of the small cylinder, which is in the same line; if now the portion of the plate carrying the steel blade acting as a spring is wound around the hinge peg, the blade of flexible steel yielding, it gets out of the fluting where it was engaged to fall back in the next one, and to maintain the said plate either in the plane or angular position, as the case requires. *Patent completed.*

246. E. H. RIPPINGILLE. *Improvements in engines worked by steam or other fluid and in pumps.* Dated Jan. 30, 1862.

This applies to those steam engines wherein the injection water, on its way to the condenser, is caused to enter a cylinder, and to act on a piston working therein, so that the power obtained thereby may be rendered available in the working of the engine. The invention consists, 1, in applying an elastic piston in the injection cylinder or engine to prevent concussion at the termination of the stroke, and also during the covering of the port by the valve. 2, in applying a chamber or vessel to the condenser, so that the injection water from the injection cylinder or engine shall be first received into such chamber or vessel, and then be by it delivered continuously in numerous streams or jets into the condenser, the chamber or vessel being of such capacity, and so arranged, as to contain sufficient water to keep up a supply to the condenser during one half stroke of the piston in the injecting cylinder. 3, in applying apparatus for refrigerating the condensed water from a steam engine in combination with an injecting cylinder or engine. 4, in a combined arrangement of air pump and injection cylinder or engine (by which the air is withdrawn from, and injection water is supplied to, the condenser), with a water pump for withdrawing the condensed water and condensed steam from the condenser. 5, in a mode of constructing steam-engine condensers. *Patent completed.*

247. J. FIRTH. *An improvement in finishing mohair cloth.* Dated Jan. 30, 1862.

Here the cloth is first woven in the ordinary manner, and the pile is then raised to a longitudinal or straight direction by the "gig mill" or other apparatus, frequently reversing the wool or pile, and it is afterwards raised in a transverse or lateral direction. The cloth is next boiled or steamed to give it a lustre, and it is then dyed and tentered in the usual way. The centre or border (or both) is then printed, and the pile re-raised, and the piece tentered, carded, and batted with sticks or rods, so as to produce a fur finish all over the piece. The fur is then cut down to a velvet pile where required, leaving the fur pile its original length at the other parts. *Patent completed.*

248. H. ROBOTTOM and R. UNDERWOOD. *Improvements in watches and pocket chronometers.* Dated Jan. 30, 1862.

This invention consists in a method of constructing watches and pocket chronometers, so that they may be wound up and the hands "set" without requiring a key or other separate instrument for the purpose. *Patent abandoned.*

249. W. DAVIES. *Improvements in apparatus for cutting cork and bungs.* Dated Jan. 30, 1862.

This invention is not described apart from the drawings. *Patent completed.*

250. W. CLARK. *Improvements in mechanical wrenches.* (A communication.) Dated Jan. 30, 1862.

This relates to self-acting wrenches for screwing and unscrewing nuts of circular, hexagonal, or other form, and of any dimensions, which wrenches are an improvement on what is known as the "Clyburn wrench." This wrench is formed with two jaws, one being fixed and the other opening from, or closing on, the part to be held, by turning the handle in one or other direction, so that the jaws may grip tubes or nuts of different dimensions, while the more difficult the nuts are to turn the greater is the force applied for pressing the handles together, and compressing the nut between the jaws, and, as the wrench cannot slip, the nut is forcibly turned. *Patent completed.*

251. A. C. B. MALOIS. *Improvements in mechanical fabrication of boot and shoe heels.* Dated Jan. 30, 1862.

These boot and shoe heels are formed of one and the same piece of leather, suitably shaped by a spherical machine, which stamps it so as to force the edges of the leather to fold over on themselves, so as to form the shell or frame of the

heel, which is afterwards filled up with discs of leather in order to complete it. *Patent abandoned.*

252. A. Larousse. *Improvements in the manufacture of wheels for wagons, locomotive engines, and other vehicles used for railway purposes.* Dated Jan. 30, 1862.

The main object here is the so making of the skeletons or centres of railway wheels that they shall possess the advantages of the wrought wheel without the great expense attendant on its manufacture. This the patentee effects by locking the inner edges of discs, when these are used as substitutes for spokes, into a wrought boss by enveloping them in the wrought metal, whereby he dispenses with the necessity for raising the sp. kes to a welding heat. *Patent completed.*

253. D. Littlehales. *An improved plastic compound as a substitute for papier maché.* Dated Jan. 31, 1862.

Here the patentee takes oatmeal, flour, pea, bean, barley, or linseed meal, which he mixes with tar or other varnish until it becomes of a thick pasty consistence, and he then moulds it in dies or forms it into sheets as required, then dries it in an ordinary japanner's stove. When dry and hard he saturates it with linseed, or other suitable oil, and afterwards finishes it with varnish, or colours it, in the usual way articles of papier maché are coloured. *Patent completed.*

254. H. White. *Improvements in collars.* Dated Jan. 31, 1862.

This invention is not described apart from the drawings. *Patent completed.*

255. J. Silvester. *Improvements in pocket and other spring balances.* Dated Jan. 31, 1862.

Here the helical or coiled spring of the balance is connected at top with a loop, by which the balance is suspended. The cylindrical case surrounding the spring is fastened at bottom to the bottom of the spring, and the hook on which the article to be weighed is supported is fixed to the outer side of the bottom of the case. The loop carries a graduated or index plate, which is situated outside the case, and on the top of the case an index finger or pointer. When an article to be weighed is hung on the balance, the case is pulled downwards, the upper part of the spring being exposed; the index finger traverses the graduated index, and indicates thereon the weight of the article. The invention also consists in constructing pocket and other spring balances, as follows:—The helical or coiled spring is without a case, a loop and ring being fixed at the top, and a second loop and hook at the bottom of the spring. An index plate is fixed to the top loop, over which index plate another plate, connected with the lower end of the spring, slides, covering the index plate. When any article is hung on the balance, and the spring elongated, the covering plate descends in front of the index plate, and uncovers that part of the said index plate which indicates the weight of the article. Or the weight may be indicated by a pointer or otherwise. *Patent abandoned.*

256. F. Baggett and J. Sanger. *An improvement or improvements in breech-loading small arms.* Dated Jan. 31, 1862.

This invention (the details of which we cannot give space to here) consists in a method of constructing the breech ends of breech-loading small arms, and parts connected therewith, for opening and securely closing the breech. *Patent abandoned.*

257. H. Schatten. *Improvements in the manufacture or construction of gas meters.* Dated Jan. 31, 1862.

This invention is not described apart from the drawings. *Patent completed.*

258. J. Dodge. *Improvements in C springs for carriages when used without a perch.* Dated Jan. 31, 1862.

The object of this invention is to insure the axles of carriages in which C springs are used without a perch being retained in their proper position, and thereby to prevent the irregular running or "wabbling" of the wheels. The invention consists in applying two parallel rods by means of a clip on the axle, and through a brace or braces to the free end of the C spring; the opposite ends of the parallel rods may be attached to the body of the carriage, or may be otherwise attached. *Patent completed.*

259. W. Walton and F. Walton. *Improvements in the manufacture of wire cards.* Dated Jan. 31, 1862.

This consists in the use of a solution of the semi-resinous substance prepared from drying oils by their being oxidised for cementing and coating fabrics in a suitable manner, to render them fit for the backs of wire cards. Backs of wire cards, composed of woven fabrics cemented and coated by the above flexible cement, will be found to resist the action of grease, oil, and moisture. Small quantities of india-rubber or gutta-percha may be combined with the solution above mentioned. *Patent completed.*

260. G. Mehrtens. *Improvements in ladies' stays, and in the bodies of ladies' dresses.* Dated Jan. 31, 1862.

These stays are formed of three pieces, one piece forming the front of the stays, and the two other pieces forming the back thereof, each portion being stiffened as usual. The front portion is slit at two points corresponding with the breasts; these slits are connected together by an elastic lacing or diagonal strapping of elastic web. The back parts of the stays are similarly slit, and laced or strapped at points corresponding with the blade bones. The back and front of the stays are fastened in the usual way. *Patent abandoned.*

261. J. Hargreaves. *Improvements in the manufacture of pipes or tubes for conveying water, gas, acids, sewage, enclosing electric telegraph wires, and for other purposes, which improvements are also applicable to the manufacture of other vessels and articles, and in the machinery or apparatus connected therewith.* Dated Jan. 31, 1862.

This consists: 1. In combining and treating various materials or substances which the inventor converts into a bituminous mastic possessing density, ductility, hardness, great strength to resist pressure, and other qualities. Bitumen, cement, chalk, clay, flint, lime, oyster and other marine shells, river or other sand, slag and slate, he uses, and utilises the refuse and short waste of cotton, worsted, wool, hemp, flax, tow, jute, cocoa-nut fibre, and other fibrous materials, gutta-percha, caoutchouc, gums, and oils. *Patent abandoned.*

262. P. Schewweghs and A. J. H. De Boisserolle. *Certain improvements in treating fatty and oily matters for obtaining their acidification, and in the apparatus employed therein.* Dated Jan. 31, 1862.

Here the patentees effect the acidification by the simultaneous employment, while in a hot state, of both sulphuric and nitric acids. *Patent completed.*

263. C. Pontifex, Jun. *Improvements in apparatus for cooling or heating fluids or liquids.* Dated Jan. 31, 1862.

This consists in the arrangement and application of a hollow disc, or a series of hollow discs or cases of circular or other forms, with or without the addition of a division plate therein, such cases being contained in a conical or other shaped vessel, placed in a horizontal or vertical position; cold or heated fluid or liquid enters the apparatus at either end of a central connecting pipe or passage, and after passing through the series of discs or cases, it is discharged at the opposite end of the central pipe or passage. These discs or cases are supported within a conical or other shaped vessel, and the fluid or liquid to be cooled or heated is passed through the containing vessel, and through openings formed through the discs or cases, until the required temperature is obtained. *Patent abandoned.*

264. E. H. C. Monckton. *Improvements in the application of electricity for obtaining ammonia, and other useful products, during the combustion of coal and fuel, and in the apparatus employed therein.* Dated Jan. 31, 1862.

The object here is to obtain ammonia and other useful products directly from the atmosphere and other sources by a continual electrical process from the commencement, by which means smoke is prevented and fuel economised. The process is firstly to form what the patentee terms an electrical bath, by applying the electrical current however generated, and with or without the use of induction or tension coils or Leyden jars, or substitutes for Leyden jars, such as the condensers of electricity attached to tension coils, to natural and artificial graphite and plumbago, and also to the coal and fuel in ordinary furnaces of all descriptions. *Patent completed.*

265. T. Stephens. *Improvements in the manufacture of book markers.* Dated Jan. 31, 1862.

This consists in manufacturing book markers by machinery for weaving ribbons, and in producing figures, designs, and mottoes thereon of various descriptions of colours. *Patent abandoned.*

266. J. Gibbins. *An improved composition for coating wood, metal, and other materials.* Dated Jan. 31, 1862.

Here the inventor adds to boiled linseed oil, while it is at a high temperature, oxides of lead, arsenic, caoutchouc in solution, borax and gum copal, in solution; and at a lower temperature he adds to the above mixture sulphur and spirits of turpentine. During the process of admixture the ingredients should be stirred together. *Patent abandoned.*

267. A. Forsyth. *Improvements in the manufacture of frames and in tablets used for advertising purposes.* Dated Jan. 31, 1862.

Under one modification for producing frames which are particularly suitable for the display of show cards or trade announcements at railway stations, &c., the frame is made of cast iron. The metal is run into a suitable mould, and the frame may be coloured, gilded, or otherwise ornamented. *Patent abandoned.*

268. C. Veronique. *An improved wrapper garment.* Dated Jan. 31, 1862.

This consists in the production of a garment which can be used as a railway rug or wrapper, and also capable of being easily convertible into a morning gown. *Patent abandoned.*

269. W. Smith. *Improvements in machinery for the manufacture of bricks, tiles, or other articles of a similar nature or character.* Dated Feb. 1, 1862.

The patentee claims: 1. The revolving cylinder and combination of parts for pressing the clay or other plastic materials into the moulds as described. 2. The ram and spring and combination of parts for resisting the action of the clay or other plastic material whilst the mould is being filled as described. 3. The block or blocks for pressing the clay into the moulds as described. 4. The steam cylinders and combination of parts for pressing the clay or other plastic material in manner described. 5. The apparatus and combination of parts for receiving and removing the bricks after leaving the mould as described. *Patent completed.*

270. L. Fauvel. *Improvements in apparatus for indicating the existence of escapes in gas-tubing, and for stopping the continuance thereof.* Dated Feb. 1, 1862.

This consists in providing either the gas meter or the tubing itself with an apparatus which is put into action by the gas passing through the meter, or through that part of the tubing where the apparatus is situated, thereby causing a wheel provided with proper projections or pins to revolve and act with the said pins against the end of a hammer, and make this latter strike an alarum. *Patent completed.*

271. R. Burkhardt and C. Doebler. *Improvements in Æolian harps.* Dated Feb. 1, 1862.

Here the strings or wires, instead of being placed on a flat board, are placed on a hollow sounding board, formed of a wedge shape, and fixed to a spindle supported on any suitable framework. Near the sides of the sounding board are placed curved wind conductors, which collect a large quantity of wind, and concentrate it upon the strings or wires, after which it escapes through a narrow passage on each side. The collection and concentration of a large quantity of wind, combined with the draught, cause a great increase of sound, and thereby produce a more pleasing and efficient instrument than heretofore obtained. The hollow sounding board is placed on a spindle to allow it to turn and catch the wind at any point of the compass. *Patent abandoned.*

272. J. Pendlebury. *Improvements in the method of, and apparatus for, lubricating steam-engine cylinders, slides, and other surfaces.* Dated Feb. 1, 1862.

This invention is carried into effect as follows:—Near the bottom of the steam cylinders the inventor connects a pipe, having at the top a small vertical cylinder, at the upper part of which is the cup for holding the tallow, oil, &c. In the interior of the small cylinder there is a double piston with a plug between them, which is hollowed in a concave form. The interior of the small cylinder is in communication with the steam cylinder by means of tubes or pipes. When the piston is at the bottom of the steam cylinder, the pipe communicating with the small cylinder is closed. When the piston is ascending, the steam passes though the pipe into the small cylinder, and raises the double piston above the orifice which leads to the steam cylinder, into which the lubricating matter is forced by the pressure of the atmosphere. When the piston is at the top of the steam cylinder, and a vacuum below, the double piston in the small cylinder descends by atmospheric pressure, and again opens the orifice leading to the steam cylinder, into which the lubricating matter enters as before. *Patent abandoned.*

273. J. Hill. *Improvements in the construction of portable chairs and other articles for sitting or reclining on road, Bath, invalid, wheel, and children's carriages, ambulances, or vehicles for carrying sick or wounded persons.* Dated Feb. 1, 1862.

The patentee claims a framework connected together by bolts or joints, such framework, when extended, being held in one given position by knuckle joints, and by the rods or pistons acting as a lever upon and regulating the opening and shutting of the same, and by means of the pressing down the lifting seat upon the spring catch, or other contrivance, rendering the joints and other parts rigid when in use. *Patent completed.*

274. J. Deprez. *Improvements in machinery or apparatus for extracting coal, ores, and other mineral substances from mines.* Dated Feb. 1, 1862.

This machine will be placed directly over the shaft, and the spindles or drums will act directly upon the barrels, and their alternate ascending and descending motion be given by a special combination, which consists in placing two separate axles, independent of each other and at suitable angles, the cranks and connecting rods intended to produce the reverse movement of the spindles or drums, and, consequently, the ascent and descent of the cables. *Patent abandoned.*

275. F. W. Daehne. *Improvements in furnaces used in the manufacture of zinc.* Dated Feb. 1, 1862.

This consists in causing atmospheric air to come in contact with the gases arising from the fire grate after they have left the grate and have traversed a portion of the furnace, whereby a complete ignition of the unconsumed products of combustion is effected. *Patent completed.*

276. T. Cook. *Improvements in machinery for punching, cutting, and pressing metals and other materials.* Dated Feb. 1, 1862.

Here the frame of the machine, so far as it is made with two jaws, the one carrying the hollow or bed-die and the other the punch or forcer, is similar to those heretofore employed, and the improvements consist in constructing and combining the parts for actuating the punch or forcing-die in the following manner:—The stem or holder of the punch moves up and down, and is properly guided in its movement. To the upper end of the stem or holder a sector, or segment of a circle, or an eccentric, is connected by a pivot or axis, on which the segment can move freely; above the segment there is a similar sector or segment of a circle, or of an eccentric, which moves on an axis or pivot covered by the framing. In order to actuate the punch or forcing-die, a screw is used to force a wedge between the two sectors, when the contiguous surfaces of the two sectors are concentric with their axes, or a parallel bar when the two contiguous surfaces of the sectors are eccentric to their axes. Provision is made for bringing back the punch or forcing-die after it has been caused to act. *Patent completed.*

277. J. Harris. *Improvements in mattresses, squabs, pillows, and other like articles of furniture.* Dated Feb. 1, 1862.

Here, in making a mattress or like article of furniture, two comparatively thin sections of a mattress, &c., in separate cases, are to be stuffed with hair, wool, &c., and between these two stuffed cases feathers are placed, and the two thin sections are sewn together at their edges, so as to produce a case to enclose the feathers, whether without a separate case. *Patent abandoned.*

278. T. Cook. *Improvements in machinery for folding envelopes.* Dated Feb. 1, 1862.

Here a sliding table is used carrying two die boxes, and the sliding table is arranged and worked so as to be moved to and fro upon a stationary table, in order to bring the two die boxes alternately under a plunger. The plunger descends twice into each die box; at the first descent it creases the envelope paper by pressing it into the die box. After the paper has been creased, the flaps are folded inwards by means of springs, levers, or instruments with which each die box is provided, and at the second descent of the plunger the folding of the flaps is completed. After the plunger has risen for the second time, the sliding table is moved a distance equal to that required to bring the other die box (covered by a piece of envelope paper) under the plunger. This movement of the sliding table also brings the die box, in which an envelope has just been completed, into a position beyond the stationary table, which enables it to discharge such envelope into a proper receiver. A fresh piece of envelope paper is then placed over this die box, which will be carried by the die box under the plunger when the sliding table is again moved. By these means envelope paper will be folded in the die boxes alternately when the boxes are alternately brought under the plunger. *Patent abandoned.*

279. W. Clark. *Improvements in machinery or apparatus for the manufacture of festooned edging or material.* (A communication.) Dated Feb. 1, 1862.

This relates to an apparatus for the manufacture of festooned edging or material. The material the patentee uses consists of ribbon or galloon cut according to the design to be produced; this is previously stiffened or sized, and in this state introduced into the machine; and in order to complete and cause it to retain the festooning or other form of the cutting, it is necessary to wind thread on to the galloon (or it may even be cardboard), and cross it. Lastly, the material is washed in order to remove the size or starch, and afterwards dried or pressed. The invention is not described apart from the drawings. *Patent completed.*

280. F. Riesbeck and W. Becker. *Improvements in locks or fastenings for bags, portmonnaies, and other like articles having metal frames.* Dated Feb. 1, 1862.

Here the patentees mount the principal part of the lock or fastening on the outside or main part of the frame (that to which the hand hold is attached), but another part thereof on the inner, or it may be termed the secondary part of the frame; on this part they place the thumb knob or piece to be acted on for the release of the catch or lock; consequently, if the bag or other article is held in the one hand, or even hung on the arm by the main or outside frame, the simple application of the other hand to the releasing knob will effect the release of the catch, and that part of the frame being simultaneously pulled away from the other, the bag or other article will be opened with facility. For this purpose it is only necessary to apply the hook or staple part of the catch on the inner frame, and actuate it by a spring, also fitted on that frame, so as to induce a tendency to keep it always in the locked position, from which it is driven by the pressure on the thumb knob or lever, as well understood in releasing spring catches. *Patent completed.*

281. M. A. F. Mennons. *Improved processes for the recovery of the oleic acid contained in the residual scouring waters of woollen and other textile materials or fabrics.* (A communication.) Dated Feb. 1, 1862.

The object of the first of these processes is to precipitate, under the form of an insoluble salt, the oleaginous matters contained in the water. By the second, the soap thus formed is decomposed. By the third, the oleic acid is separated from all the soluble salts formed in the preceding operations, as also from the excess (if any) of the acid used to effect the decomposition. By the fourth, the impure oleic acid is freed from the watery residues. By the fifth and last, this acid is separated from the insoluble salts and foreign matters which it may hold in suspension. One of the most important of these applications will be found in the utilization of the scourings of the woollen yarns and fabrics, and in the preparation of which large quantities of oil are consumed. *Patent completed.*

282. L. Hill. *Improvements in applying armour plating to war ships.* Dated Feb. 3, 1862.

The patentee claims the securing of armour plates upon the sides of war ships by fastening bars formed to overlap and protect the edges of the plates, and themselves fixed by screw bolts tapped into them from the inside, as described. *Patent completed.*

283. D. Joy. *Improvements in machinery for forging metals, also applicable to other purposes.* Dated Feb. 3, 1862.

This consists in actuating hammers (hitherto driven directly by tappets, cranks, cams, or eccentrics) by the intervention of a spring or elastic medium between such tappet, crank, cam, or eccentric, thus giving to the blow the character of elasticity; and to moderate the force of the blow the patentee takes up such elasticity by allowing the hammer, bar, or block to work in a cylinder, or itself to be a cylinder in which a piston is suspended; and he admits air freely to such cylinder to check it therein, thereby checking the blow due to the momentum of the hammer, bar, or block, driven as above described. 2. The invention has reference to steam hammers, and is supplemental to a patent dated Nov. 1, 1860 (No. 2668), and consists in leaving out the valve for the admission and exhaustion of steam, and in making the piston itself serve as a valve by allowing it to pass over and uncover a port or ports in the cylinder at proper intervals for the admission and exhaustion of steam; or he reverses the action, and makes the piston stationary and allows the cylinder to move over it. *Patent completed.*

284. C. W. Lancaster. *Improvements in strengthening cast iron ordnance.* Dated Feb. 3, 1862.

This invention consists in removing the rear end of the gun, including the whole of the cascable, before or after the gun has been strengthened with wrought metal in the form of a hoop or hoops, jacket or jackets, or both hoops and jackets, in forming a thread on the jacket or hoop, and in screwing thereon or therein a wrought iron or steel-breech end or cascable, so as to close the rear end of the gun. *Patent completed.*

285. C. Stevens. *An improved axletree.* (A communication.) Dated Feb. 3, 1862.

The chief feature of this improved axle is, that it is made in two equal parts, placed end to end in the same vertical plane, both movable and independent of each other. The other end of this double axle is of steel, spherical in form, and resting in a single concave bracket or support contained in a rectangular box. The wheels are wedged on the axle journals, and furnished with a central plate on either side, both wheels and plate being easily taken off. The axle has a shoulder at the outer part of the side bearing. The lower part of the central bracket and the outer parts of the side bearings are furnished with a tolerably large opening, by which they may be raised or lowered by a screw. The rectangular box of the bracket is formed of three pieces of sheet iron connected by tie pieces, or other suitable means, the upper plate being pierced with three apertures for the gearing. *Patent abandoned.*

286. J. J. King. *Improvements in the fastenings of bedsteads, which fastenings are also applicable to other portable framework.* Dated Feb. 3, 1862.

This consists in the application of a disc having snail grooves in the side, or other suitable snail pieces, which the inventor disposes in one part of the framework (in the horizontal rail by preference), while on the post or upright he fixes a dovetailed socket piece; this socket piece projects from the side of the post, and is received in a recess in the end of the rail. The disc snail piece he recesses in the end of the rail, and mounts it on a suitable axis, so as to present its periphery towards the end of the rail. The part of the periphery of smallest radius permits the insertion of the socket piece. The snail piece is rotated by a suitable key applied to its spindle. When fixing the parts together, the part of the periphery of smallest radius is turned to position, and the socket piece is fixed to the post inserted; the disc piece is then rotated, and the narrow part of the dovetailed socket enters the snail grooves on each side of the disc, while the broad part of the periphery is received in the wide part of the dovetail. The snail form of the grooves draws the parts slowly and forcibly together, and fixes and holds them firmly as required. *Patent abandoned.*

287. W. E. Newton. *Improvements in machinery for spinning.* (A communication.) Dated Feb. 3, 1862.

This relates to the motion of the delivering rollers during the operation of winding on in the mule jenny machines. The invention consists in giving to the delivering rollers during the winding on a differential or varying motion, which must be dependent on and governed by the circumference of the rollers and their speed of rotation during a given time; and also the distance travelled by the carriage during the same time. These motions must be arranged to decrease as the carriage approaches the delivering rollers, and the motion of the rollers may, if desired, be completely arrested before the carriage has arrived at the end of its course. *Patent completed.*

288. W. Clark. *Improvements in processes for preserving and colouring wood denominated xylochromic and xyloplastic processes.* (A communication.) Dated Feb. 3, 1862.

The details of this invention are too voluminous to be quoted here at sufficient length for an intelligible abstract. *Patent completed.*

289. T. M. Merkins. *The production of a projectile and explosive force to be used in instruments of war, for an electro-gas gun and electric-gas shell, for a method using the recoil of weapons, for the purpose of increasing the pressure of elastic fluids, for the production of a projectile force, for a method of rapidly loading weapons at the breech, and of a motive force to be used in an electric gas engine and other engines.* Dated Feb. 4, 1862.

This force is derived from the gases resulting from the decomposition of water at very high pressures by electricity. *Patent completed.*

290. G. Manwaring. *Improvements in flushing apparatus for closets, sewers, and other water services.* Dated Feb. 4, 1862.

This consists in self-acting mechanical appliances, whereby the closet is cleaned by supplying water through a cistern connected to and working with a small supply cock or inlet valve, to which the patentee applies an air vessel, by which the supply valve can be worked against any pressure with ease and soft action, the large outlet or discharge valve from which is closed while the inlet valve is opened, and *vice versâ.* *Patent completed.*

291. C. M. Roullier. *Improvements in the manufacture of straps, bands, chains, and other like articles.* Dated Feb. 4, 1862.

This consists in utilizing waste pieces of new or old leather, by employing them alone or combined with metal or other material for the manufacture of driving straps, bands, chains, and other like articles for transmitting motion or power, and in the mode of manufacturing the same. *Patent completed.*

292. P. Gardilanne. *Improvements in the manufacture of metallic wire fencing.* Dated Feb. 4, 1862.

Here the inventor employs a lath composed of a strip of hoop iron, pointed at top and cut out at bottom, to which is or are fixed one or more buttons, double or single. These buttons project on the flat part of the lath, and the wire lodges during its torsion between the lath and the head of the button. By the ordinary weaving machine, the torsion or twisting of the wire grasps or binds the lath on each side, whereas by the present invention the neck of the button is enveloped by one twist, either by a single or double chain. The lath being grasped on either side of the division, and held from top to bottom by the twist given at the button, it cannot possibly get out of place. As many holes as may be desired are pierced and cut out of the laths, which are then passed to a plate where the buttons are fitted. Thus prepared, the laths are delivered to the weaving machine. The weaving is effected by means of the single chain or warp formed of two wires, and of the double chain formed by four wires; the one and the other are twisted by machinery together with the lath and the button, and the fencing (which is then made) rolls during the weaving around a spindle. This fencing may be fixed on any description of posts. *Patent abandoned.*

293. J. L. Norton. *Improvements in beating, stretching, and drying fabrics, and in the apparatus employed therein, part of which apparatus is also applicable for thrashing linseed.* (Partly a communication.) Dated Feb. 4, 1862.

Here the operation of "beating" is effected by mechanism, instead of by hand, the fabric being caused to pass between two rows of sticks, which are fitted into metal sockets, and in connection with these sockets are short arms or projections, which, being acted on by tappets or shafts suitably arranged and driven, give the requisite motion to the sticks to cause them to strike the fabric. With this beating machine is combined a tentering, stretching, and drying machine. *Patent completed.*

294. R. A. Brooman. *Improvements in the manufacture of hard and soft soaps, and in the preparation of liquids for washing linen and other textile fabrics.* (A communication.) Dated Feb. 4, 1862.

The essential feature of this invention is the employment of alkaline silicates in the manufacture of toilet and household soaps, and in the washing of linen and other textile fabrics. *Patent abandoned.*

295. J. Greenwood. *Improvements in means or apparatus for preparing and combing wool and other fibres.* Dated Feb. 4, 1862.

In such machines it is now usual to apply a feeding comb just over the delivery or clearing points of the series of heckle points or teeth through which the fibre is conducted in its passage to the receiving or carrying comb. The inventor finds it desirable to place this feeding comb so that its position of rest may be somewhat backwards of that now adopted to admit of a dabbing brush or series of brushes, or series of plates or grates acting upon the fibre in the delivery or clearing combs, and he carries these brushes, or it may be a series of grates, upon levers, so that they may have motion given to them extra of that given to the ordinary grates or brushes acting with the heckle points in such machines. These levers are controlled to work so that the brush they carry will not come in contact with the dividing bar in its upward motion. He also applies a narrow fine comb to the part of the dabbing brush working into the receiving comb, and also one to work into the delivery or clearing comb. He also applies the teeth in the carrying comb at an angle, the teeth inclining forwards; and in place of this comb being controlled to move simply in a horizontal direction, he places the bearings of the rods by which it is supported in an inclined direction, so that its motion may be at an angle to the heckle point. He also applies between or about the heads of the front and back or other rows of comb teeth in the receiving or carrying combs, india rubber, or other suitable flexible material, to receive the edge of the plate carried by the dabber or nipper, or other detaining apparatus in such machines upon the fibre as fed into such carrying or receiving combs. *Patent completed.*

296. W. W. Williamson. *Improvements in apparatus for drying cloths and fabrics.* Dated Feb. 4, 1862.

This relates to a novel mode of constructing hot closets, in which clothes or other textile articles of domestic use are dried after being washed. The apparatus consists of a long box or chamber of suitable dimensions, and is constructed by preference of wrought iron, the framing being formed of T or angle iron, and the panels of two pieces of sheet iron, between which are secured a sheet of felt or other non-conducting substance. The panels thus made are secured to the wrought-iron framing by screws, bolts, rivets, or otherwise; and the several parts of the apparatus are secured together in such a manner by temporary fastenings as will admit of their being taken to pieces when required. The apparatus may be heated by a fire made in a separate fire-place but communicating with flues made in or adapted to the lower part of the closet, and so arranged that the heated gases will pass to and fro, or in a serpentine direction, so as to give off their heat to a stream of atmospheric air that is allowed to enter the apparatus from below, and pass over the heated surfaces of the flue pipes. *Patent abandoned.*

297. J. Webster. *Improvements in gas fittings.* Dated Feb. 4, 1862.

This invention refers: 1. To improvements in the knibs and burners. 2. To the slides of movable pendants or gaseliers. In making the knibs or burners the patentee cuts the aperture for the gas in such direction that the flame jets out downwards, and then rises upwards slightly in an unbroken form. In the argand burner he perforates the holes in a ring in the side of the burner, instead of upon the top; the effect of this arrangement is that the air acts upon the flame immediately as it issues from the burner, and more perfect combustion is insured. The improvements in the sliding parts of movable pendants or gaseliers, consist in the employment of a substitute for the balance weights and chains connected to the ordinary water slide, which substitute is thus formed upon the water cup. He screws a gland or stuffing box provided at the top with a screw or nut for tightening the parts round the fixed tube. He wraps loosely a strip of thin metal or metal gauze overlapping the joint, and he prefers for this purpose block tin in the form of thin sheets. Over this runner, and completely surrounding it, he places a short tube of vulcanised india rubber acting with equal pressure all round the metal runner; the rubber keeps the metal runner always in contact with the fixed gas tube. A loose collar is employed to work upon the top of the india rubber tube, compressing it, but without affecting the metal runner, and this loose collar is kept to its work by a screw and cap working into the stuffing box. *Patent completed.*

298. W. E. Newton. *Improvements in the manufacture of iron and steel.* (A communication.) Dated Feb. 4, 1862.

The patentee claims: 1. The conversion of iron into steel by subjecting it in the molten state to the combined action of potash, or other alkali, carbonate of lime, oxide of manganese, and charcoal, as set forth. 2. The purifying of the iron preparatory to such conversion into steel by the use in the smelting or other furnace, of the ores of zinc, in combination with jets of steam or water, substantially as described, when such purifying process forms part of a continuous process with the conversion, that is to say, when the iron is conveyed in a molten state from the purifying to the converting furnace. *Patent completed.*

299. D. Gallafent. *Certain improvements in the mode or modes of generating or producing elastic vapours to be used as a motive power.* Dated Feb. 5, 1862.

The object here is to obtain an elastic vapour or mixture of hot air and steam to be used as a motive power for high pressure engines, and the manner in which the patentee produces this compound of heated air and steam is by lighting a fire in a closed furnace surrounded by water, and afterwards forcing the heat and gaseous products of combustion from such furnace into the water space of the boiler, so that the water will be evaporated by the direct application of the heat of the fire, as well as by conduction. *Patent completed.*

300. W. E. Taylor. *Certain improvements in carding engines.* Dated Feb. 5, 1862.

This consists in driving the doffer from the "licker in" in order to stop the feed rollers when the "licker in" is stopped, thus preventing the injury to the card teeth resulting from the feed rollers continuing to supply the fibrous material when the "licker in" is stopped. One mode of performing the invention is as follows:—The "licker in" is driven as usual by a strap from the main cylinder, and the "licker in" by a strap gives motion to a pinion, by which the doffer is driven; the feed rollers are driven as usual by the doffer. *Patent completed.*

301. J. King. *Improvements in lubricators for lubricating the moving parts of machinery.* Dated Feb. 5, 1862.

This invention consists: 1. In applying a cover or guard to the ordinary oil cup employed on the brasses or bearings in which rotating shafts or axles of machines work. 2. In certain regulations to be placed in oil cups for regulating the flow of the oil. *Patent abandoned.*

302. E. F. Smith and T. Swinnerton. *Improvements in the manufacture of coke, and in kilns or ovens for the manufacture of coke.* Dated Feb. 5, 1862.

The patentees claim: 1. Passing a current of cold air by means of a stack through the coal being coked, the said current being made to pass from the exterior to the middle of the mass of coal being coked. 2. The improvement or improvements in kilns or ovens for the manufacture of coke, as described. *Patent completed.*

303. J. Browning. *Improvements in aneroid barometers.* Dated Feb. 5, 1862.

The first part of this invention consists in means of correcting the barometers for temperature, a requirement arising from the fact that, however carefully a vacuum is attempted to be established between the corrugated plates, yet some portion of air will remain between them; this air, expanding or contracting upon being influenced by extremes of heat or cold, renders compensation in the instrument, in order to render it perfect, or as nearly so as may be, necessary. These means of obtaining the compensation, or of correcting the barometer for temperature, consist in making the working parts, in some of them, of compound metals, or of metals of different degrees of expansibility. Another part of the invention consists in a new form and arrangement of the spring, connected to, and which takes the working from, the corrugated plates, to transmit it through other parts to the needle. The spring consists of a simple bent blade, formed in one piece, united by a screw, by which the spring is adjusted to the foundation plate or bed of the instrument; the other end of the spring plate terminates in an eye, by which it is connected to the working parts as hereafter explained. The invention also consists in the following arrangement of the working parts:—The eye in the end of the spring receives a stud, by which a slotted link is connected to the spring; in this link a stud, free to be moved and fixed at any desired point in the slot, is fitted; one end of this stud carries a roller, upon which the transmitting lever rests. From the transmitting lever the inventor carries a connecting blade to a short lever on the cradle, and he makes this lever so that it may be readily made shorter or longer, in order to obtain any adjustment required. He threads this short lever, and passes it through two plain eyes rising from, and forming part of, the cradle; then, by means of nuts screwed up against the eyes, he obtains the exact length required. Again, he forms the barrel, round which the chain passes for working the spindle of the needle, conical. *Patent abandoned.*

304. H. Ashworth. *Certain improvements in machinery or apparatus employed in spinning cotton and other fibrous substances.* Dated Feb. 5, 1862.

This invention consists, 1, in the employment of an endless band of felt or other material passing beneath the bobbins, having washers interposed, such endless band being distended between two vertical rollers, but depressed into a horizontal position (as beneath the bobbins) by other horizontal rollers. When the band is at a proper and required tension, the revolution of the bobbins causes or imparts to the band, by frictional contact, a slow but regular travelling motion, constituting a perfect "drag" upon the washers and bobbins, and with less wear to such "drag band" than hitherto, by reason of its continual movement. The invention consists, 2, in the formation and use of a projection upon the arm of the "flyer," arranged and shaped in such a manner as to catch up the slack yarns which sometimes occur between the flyer guide wires, and prevent it coming into contact with the revolving bobbin. *Patent completed.*

305. E. HARRISON. *A certain compound or certain compounds to be used as a substitute for gunpowder.* Dated Feb. 5, 1862.

This consists in an admixture of chlorate of potash, nitrate of potash, starch, yellow prussiate of potash, and charcoal, to form an explosive compound. *Patent abandoned.*

306. W. CAMPION and H. JOHNSON. *Improvements in machinery or apparatus for making the welts of hose or other articles made of looped or knitted fabrics, applicable also for other purposes.* Dated Feb. 5, 1862.

This consists in making the welts of hose or other articles made of looped or knitted fabrics, by the use of a hook and needle and cylinder, each of suitable construction, and operated upon by a cam and worm, and by a wheel. The needle used works inside the cylinder. The fabric of which the welt is intended to be made is placed on the cylinder, and upon the cylinder is secured a notch or pin, which comes in contact with a lever on each revolution, in order temporarily to stop the machine; the lever is again applied, and another revolution is performed. *Patent abandoned.*

307. J. LEO. *Improvements in traction engines.* Dated Feb. 5, 1862.

This consists in placing the axle on which the traction wheels of the engine are mounted about the centre of the length of the boiler, so that the said boiler may be balanced across the said axle, and one end of the boiler be raised or lowered by a lever when going down or up hill, in order to keep the boiler as near as may be level at such times. *Patent abandoned.*

308. J. B. PAYNE. *Improvements in the treatment or preparations of hemp, flax, and other analogous fibrous substances for spinning.* Dated Feb. 5, 1862.

This consists in submitting the crude fibres to the action of steam and friction at the same time. *Patent completed.*

309. A. V. NEWTON. *An improvement in firearms.* (A communication.) Dated Feb. 5, 1862.

Here the end of the barrel of the weapon is provided with a cutter, or a notched, toothed, or otherwise roughened edge, by applying the cartridge to which they may be readily cut or broken, and thus the necessity for biting cartridges is avoided. *Patent completed.*

PROVISIONAL PROTECTIONS.

Dated April 10, 1862.

1023. W. Nunn, 179 Saint George Street, St. George's-in-the-East. Improvements in the construction of lanterns for ships and signals.

Dated April 11, 1862.

1043. W. E. Gedge, 11 Wellington Street, Strand. An improved lamp for lighting mines. (A communication.)

Dated April 16, 1862.

1096. T. Edwards, Liverpool, gas engineer, and J. Harrison, Liverpool, ironmonger. Improvements in letter-receiving boxes and other like receptacles.

Dated April 21, 1862.

1155. S. P. Matthews, Wolverhampton. Improvements in vices.

Dated April 25, 1862.

1212. J. T. Davies, Liverpool, provision merchant. Improvements in circuit horse power. (A communication.)

Dated May 20, 1862.

1526. M. Vogl, Sambrook Court. Improved apparatus for protecting houses and other buildings from burglars.

Dated June 18, 1862.

1797. J. Wheater, Lee Mill, Bacup, Lancashire, mechanic, and J. Townend, Pippin Bank, Bacup, overlooker. Improvements in self-acting and other mules for spinning cotton or any other fibrous substances.

Dated July 1, 1862.

1915. E. F. Prentiss, Birkenhead, carriage manufacturer. Improvements in the construction of omnibuses and other four-wheeled vehicles.

Dated July 18, 1862.

2050. W. Gossage, Widnes, Lancashire, chemist. An improved method of and apparatus for decomposing chloride of sodium and chloride of potassium, for the production of compounds of soda and potassa.

Dated July 19, 1862.

2058. A. B. Brown, Castle Farm, Stockport, engineer. Improvements in steam engines and boilers.

Dated July 22, 1862.

2092. J. J. Haley, 7 King Street, Cheapside, merchant. An improved machine for wringing clothing and other woven fabrics. (Partly a communication.)

Dated July 23, 1862.

2096. A. Vignon, 20 Southampton Buildings, Chancery Lane, major in the corps of Engineers, France. Improvements in the means and apparatus for extinguishing fires either on land or water. (Partly a communication.)

Dated July 25, 1862.

2112. J. Anderson, Allan Bank, near Braco, Perth, starch manufacturer. Improvements in separating gluten from starch, and in preparing gluten for food.

2114. W. Clark, 53 Chancery Lane, engineer. An improved apparatus for decanting wine. (A communication.)

2118. E. Comfort, Richmond Terrace, Grosvenor Park, Camberwell. Improvements in watch protectors.

2120. E. Tysall, Riding House Street, Portland Place, electro plater. An improved manufacture of fork.

Dated July 26, 1862.

2122. A. V. Newton, 66 Chancery Lane, mechanical draughtsman. An improved mode of attaching armour plates to ships. (A communication.)

2124. J. H. Selwyn, Woodland Craig, Grassmere, captain in the Royal Navy. Improvements in apparatus employed in paying out and raising electric telegraph cables.

2126. R. Low and W. Duff, Dundee, brassfounders. Improvements in apparatus or means for producing an adjustable pressure on certain parts of machinery.

Dated July 28, 1862.

2128. H. Bollinger, Teesdale Iron Works, Stockton-on-Tees, engineer. Improvements in machines employed in ship building, part of which are also applicable to other purposes.

2136. A. Noble, Bristol, analytical chemist. Improvements in obtaining and treating compounds of alumina.

2138. J. Ellis, Witham, Kingston-upon-Hull, corn factor and dryer. Improvements in apparatus for washing corn and other grain.

2140. H. Hedgely, Great College Street, Camden Town. Improvements in lamps.

Dated July 29, 1862.

2148. E. T. Hughes, 123 Chancery Lane. An improved process of refining the slag from blast, puddling and other furnaces, and the employment of the refined material for mortar, stones, slabs, ornaments, and other similar articles. (A communication.)

2150. J. Norris, Great Russell Street, Bloomsbury. Improvements in the arrangement or construction of ovens.

Dated July 30, 1862.

2156. G. Nock, Brierley Hill, Stafford, steel and iron manufacturer. A new or improved safety or movable self-acting crossing for railways. (A communication.)

2158. W. E. Gedge, 11 Wellington Street, Strand. Improved means or apparatus for securing the safety of trains moving on railways. (A communication.)

2160. B. Bailey, Leicester, machinist. Improvements in means or apparatus for cutting chaff and other vegetable matters, which improvements are also applicable to cutting or mowing short or lawn grass.

2164. G. H. Birkbeck, 34 Southampton Buildings, engineer. Improvements in the means or processes employed for preserving timber from decay or destruction. (A communication.)

2166. T. Holt, file manufacturer, and F. L. Stott, machine maker, Rochdale. An improved composition or compositions for protecting polished surfaces of iron and steel against oxidation, and for renewing and improving the polish of such surfaces.

2168. J. W. Dixon, jun., Sheffield. Improvements in coffee urns.

Dated July 31, 1862.

2174. G. T. Bousfield, Loughborough Park, Brixton. Improvements in the manufacture of fluids suitable for burning in lamps and for other uses. (A communication.)

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2161. H. White, Hampstead Road. Improvements in shirt collars. Dated July 30, 1862.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

879. T. Cole. Manufacture of figured ribbons.
883. E. B. Hart. Cutting cork. (A communication.)
891. W. Tyler. Composition for feeding animals.
894. W. B. Lord and H. Gilbart. Hame slip for suddenly releasing horses.
895. W. B. Lord and F. H. Gilbart. Firearms.
897. R. C. Ransome. Thrashing machinery.
901. J. M. Clements. Sewing machines.
912. F. Knudsen. Chronometers.
917. E. Hartley and J. Hinchcliffe. Rolling or straightening metal spindles, shafts, or rods of a cylindrical or tapered form.
920. J. Platt and W. Richardson. Applying motive power.
923. G. Holcroft. Blast furnaces.
927. W. Malam. Manufacture of gas.
930. B. Blackburn. Lubricating axles.
931. S. Hunter. Anchors.
932. T. Moore. Winding apparatus.
935. W. Leopard. Railway brake apparatus.
938. W. Helme. Fire-lighters.
939. R. Morton. Cooling liquids.
940. G. Bower and J. Qualter. Metallic pistons.
943. R. M. Toogood and J. Laybourne. Railway crossings.
944. W. Kemp and T. Cowley. Manufacture of silk pile velvet.
946. D. Wilson and E. A. Cowper. Pressing cotton, fibrous materials, and hay.
947. J. Lee. Traction engines and boilers.
948. A. Mann. Photographic apparatus.
949. W. A. Richards. Manufacture of bags.
951. J. F. Woodall. Ventilating carriages for common roads.
952. J. C. Kay and W. Hartley. Steam engines.
955. F. C. Bakewell. Letter-printing machines. (A communication.)
958. H. Fletcher. Valves.
961. R. A. Brooman. Case for holding balls and reels of cotton, silk, and other threads. (A communication.)
966. W. E. Newton. Manufacture of iron and steel. (A communication.)
976. L. Faconnet. Tiles.
979. B. Thompson. Steam engines.
983. A. Harris. Gun barrels.
984. E. Welch. Stoves, fire grates, ovens, and kitchen ranges.
985. G. Haseltine. Lamps for burning hydro-carbon oils. (A communication.)
988. J. Watremez. Indicating a deficiency of water in steam generators.
991. J. Brown. Protecting the bottoms and sides of ships.
999. J. Jaques. Instruments used in the game of Croquêt. (Partly communicated.)
1000. B. Sharpe. Harrows and rakes.
1008. S. Farron. Apparatus for regulating the supply of steam from the boiler to the cylinder or pipes of steam engines, which improvements are also applicable to gases or fluids.
1009. G. Hollinshed. Sandwich cases.
1011. W. Taylor. Preparing and spinning cotton.
1014. J. Langston. Manufacture of Portland cement.
1027. C. P. Coles. Masts for ships.
1029. L. Christoph, W. Hawksworth, and G. P. Harding. Drawing metals.
1037. W. Fox. Brooms and brushes.
1039. H. Holland. Manufacturing the stretcher joints of umbrellas and parasols.
1053. I. Whitesmith. Power looms.
1054. J. Bunnett. Revolving shutters.
1071. C. Harratt. Manufacture of masts, yards, and booms.
1111. J. Ashbury. Permanent way of railways.
1155. S. P. Matthews. Improvements in vices.
1168. S. S. Putman. Machines for forging horse shoe nails and other articles.
1181. J. Price. Spikes for railways and other purposes.
1498. R. Davison and T. Johnson. Washing and cleansing casks.
1525. E. Fewtrell. Manufacture of metal tubes.
1601. J. F. Harrison. Preserving the bottoms of ships.
1612. P. Boisset and B. Antoignini. Manufacture of boots and shoes.
1795. G. Haseltine. Roofs for railroad cars and hurricane decks of vessels. (A communication.)
1877. J. B. Coquatrix. Weaving carpets, tapestry, and similar fabrics.
2050. W. Gossage. Decomposing chloride of sodium and chloride of potassium for the production of compounds of soda and potassa.
2054. J. R. Abbott. Sliding chandeliers, gaseliers, and other pendent lamps.
2104. H. Rawson and F. Staples. Machinery for combing wool and other fibres.
2161. H. White. Shirt collars.
2174. G. T. Bousfield. Manufacture of fluids suitable for burning in lamps and for other uses. (A communication.)

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed August 7, 1862.

358. J. Brinsmead.
361. J. J. M'Comb.
364. G. J. Aman.
365. F. Tolhausen.
367. J. Brickhill.
369. A. Hinshaw.
370. R. A. Brooman.
371. J. S. Joseph.
372. T. Spencer.
373. A. Samuelson.
376. J. S. Joseph.
379. W. Williams.
383. C. D. Abel.
390. E. E. Allen and J. Stewart.
392. E. Green and J. Newman.
399. T. D. M'Farlane.
408. C. Turner and J. Shaw.
417. J. Russell.
420. J. Hodgkinson and D. Greenhalgh.
423. E. T. Hughes.
424. T. Birdsall and J. Birdsall.
440. W. B. Adams.
451. E. M. Stoehr.
461. H. Ward.
474. J. Millington.
491. W. Clark.
499. J. Carnaby.
595. J. Sidebotham.
624. S. S. Bromhead.
745. M. A. F. Mennons.
904. W. M'I Cranston.
1650. L. Chaubart.
1712. G. Haseltine.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1892. J. Sidebottom.
1836. J. Cannon.
1849. W. Muir.
1884. E. Stone.
1858. W. Bouch.
1878. C. Mather.

PATENTS ON WHICH THE SEVENTH YEAR'S STAMP DUTY HAS BEEN PAID.

1774. J. Macintosh.
1830. E. Topham.
1854. F. May.

LIST OF SPECIFICATIONS PUBLISHED

During the Week ending August 9, 1862.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s. d.		s. d.		s. d.		s. d.		s. d.		s. d.
1	0 4	12	0 4	23	0 4	34	1 6	46	1 2	57	0 8
2	0 4	13	0 6	24	0 10	35	0 4	47	0 4	58	0 8
3	0 10	14	0 4	25	0 4	36	1 8	48	0 6	59	1 4
4	0 4	15	1 2	26	0 8	37	0 4	49	0 4	60	0 8
5	0 10	16	0 4	27	0 10	39	0 8	50	0 4	...	...
6	0 8	17	1 8	28	1 8	40	0 8	51	0 8	...	...
7	0 4	18	0 4	29	0 4	41	0 4	52	0 4	...	...
8	0 6	19	0 8	30	0 4	42	0 4	53	0 8	...	...
9	0 4	20	1 4	31	0 8	43	0 8	54	0 4	...	...
10	0 4	21	0 4	32	0 4	44	0 8	55	0 4	...	...
11	0 8	22	1 4	33	0 4	45	0 8	56	2 10	...	...

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, AUGUST 22, 1862.

PROPOSED NEW PATENT OFFICE BUILDINGS.

AT length a ray of hope's sunshine illumines the dark horizon of the Great Seal Patent Office, and there appears some chance of that ray developing itself into broad daylight. It is not necessary for us to expatiate upon the inconveniences, and annoyances which have for many years past beset the footsteps, and hampered the movements of would-be patentees. Those inconveniences and annoyances are, alas! themselves patent and notorious to very many of our readers, as well as to ourselves. The Patent Office of this country is one of its most important institutions, and yet the buildings in which the ever-growing business connected with it is carried on, are a standing disgrace and reproach to the scientific community. The rooms of the Great Seal Patent Office are at once dark, ill-adapted for their purpose, and far too small. The solitary advantage attending the place is, its central and accessible situation. This is marred, however, by its internal unfitness for its purpose, as too many witnesses are painfully capable of attesting. We are aware that much has been done by the present able and indefatigable Superintendent of specifications, Mr. B. Woodcroft, to lessen the evils which those have to undergo whose duty calls them to the Patent Office; but that gentleman cannot achieve impossibilities. There is a limit, even, to his performances. He cannot convert the sow's ear into the silken purse, although he has, perhaps, performed feats analogous to it in the dark recesses of the Chancery Lane sarcophagus. Out of disorder and confusion, he has produced order and regularity; and by what has been accomplished, under the greatest difficulty, he has shown what may be done in an open field, and with fair play.

We must return, however, to the hopeful gleam of light which gladdens our hearts, and which, we trust, will prove no mere "will-o'-the-wisp." The Commissioners of Patents have just communicated their report to the Lords' Commissioners of the Treasury, on the subject of building a new Patent Office, Library, and Museum, and they report most favourably on the undertaking. To the analysation of that report we shall now, therefore, address ourselves. The document sets forth in the first instance, *in extenso*, the report made on the same subject by the Commissioners of Patents in 1855. With the substance of that report, the readers of the MECHANICS' MAGAZINE of past days are no doubt familiar; but, as the circle of our subscribers has largely extended itself since the publication of the new series of this journal, it may not be irrelevant to note again its salient points. "In 1853," says this report, "these offices were sufficient in number, and "accommodation for the ordinary business of "the Patent Department. In the year 1855 "the Commissioners of Patents established a "free library within their office, containing "works of science in all languages, the pub-"lications made by the Commissioners, and "the works upon patented and other inven-"tions published in the British Colonies and "in foreign countries. This library has in-"creased, and continues to increase, partly by "purchase, but in a great measure by gifts, of "useful and valuable books. It was resorted "to at its first opening by inventors, engineers, "and mechanics, as well as by barristers, "solicitors, and agents; it has now become a "collection of great interest and importance, "and the number of readers has so much in-"creased that convenient standing-room cannot "be found in the two small rooms within the "office which only can be appropriated to the "library. It is the only library within the "United Kingdom in which the public have "access, not only to the records of the patents "and inventions of this country, but also to "official and other documents relating to in-"ventions in foreign countries, without pay-"ment of fees. A largely increased accom-"modation is urgently required." So said the Commissioners of 1855; and when it is remembered that the intervening time has witnessed a continual extension of the library, and a steady increase in the number of inventors and patentees availing themselves of it, the state of the Chancery Lane Patent Office may be imagined, even by those who have not sad reminiscences of visits paid to it. We say nothing of the Patent Museum, driven to take refuge in a small portion of the remarkable edifice reared by the not less remarkable Captain Fowke, at South Kensington, and facetiously known as "The Boilers."

It is needless to transcribe further the opinions of the Commissioners of the year 1855. Their report was, at least, unmistakable on the main point to which their attention was directed—that of increased accommodation and facilities for the researches of persons interested in inventions and patents.

The report of the Commissioners of 1862 recapitulates the fruitless negotiations which followed the presentation of their predecessors' ultimatum, and more especially those entered into for the possession of a portion of the gardens of Burlington House. As those negotiations were barren of results, it is not at all necessary for us to say more about them. Let the dead bury their dead: it is ours to treat of the living. After describing the arrangement of the varied contents of the Patent Museum at South Kensington, the Commissioners state that they "are also in possession "of a large number of valuable models, which "still remain in cases because room cannot be "found for them in the South Kensington" house of refuge. Indeed, they assert that "so "limited is the space there, they are obliged "to postpone the acceptance of many valuable "models, offered as gifts by manufacturers and "inventors. Several good models of machines "have also, for the same reason, been removed, "to afford room for machines of a higher "degree of interest." Thus it is that works which have cost their inventors much time, labour, and money, and which, under happier circumstances, might become excellent examples to young mechanists and others, are crowded out of sight; and might, for any practical use they are, be consigned to the care of the dealer in marine stores. It is truly remarked by the Commissioners of 1862, that, "in connection with the erection of the ne-"cessary buildings for the objects above speci-"fied, a most important consideration is the "spot to be selected for that purpose. The "readers in the library being of the class of "scientific persons, barristers, mechanical en-"gineers, chemists, inventors, skilled work-"men in the various factories, solicitors, and "patent agents, it is obvious that the readers "should be enabled to read the books and ex-"amine the machines and models at the same "time and in the same place." This position is so strong that we imagine no one will be bold enough to assail it. In fact, we have so often urged the desirability of uniting under the same roof, or at least of having in close proximity to each other, the whole of the adjuncts and accessories of the Patent Office, that it is needless to reiterate here that conviction.

So far, then, the Commissioners and ourselves are at one. We can scarcely say the same with regard to the site they propose for the new buildings. It is of the very last importance that that should be central, and therefore of facile access to the classes of persons whom the Commissioners very correctly designate as those most likely to require the aid of the Patent Office advantages. They state that in 1860, "we proposed to your "Lordships' Fife House and gardens in White-"hall as a convenient site for the Patent Office "buildings, and museum, and one that "would unite all the necessary requirements. "The question of the embankment of the "river stopped the way at that time, and "hence negotiations again hung fire. This dif-"ficulty is now removed . . . and it is conse-"quently open to Her Majesty's Government, if "it should think fit to do so, forthwith to ap-"propriate the site of Fife House for the erec-"tion of the Patent Office buildings."

This, then, is the culminating point in the last report, and it undoubtedly has the merit of propounding a practicable solution to the *vexata quæstio.* We have no desire to be unnecessarily fastidious, and would certainly prefer that the Patent Office buildings should be erected at Whitehall to things remaining as they are. Whitehall, nevertheless, is not the centre around which revolve those practical but lesser luminaries who would delight to add to their lustre, by borrowing some from the Patent Office, the Library, and the Museum.

With little difficulty we believe a site might have been found which would have fulfilled all the conditions that are essential to the full efficacy of the Patent Department of the State. It may be that some old buildings would have to be bought and removed to make way for the new institution, but the enormous funds available to the Commissioners would smoothe the way for the accomplishment of this end, and in all respects the public would be the gainers. If Fife House and grounds occupied the only site available for the proposed buildings, why then we should endorse cordially the views of the Commissioners; but as that is manifestly not so, we would ask them to cast a look in the direction of the existing Patent Office, and see whether it is not possible to obtain room in its neighbourhood for the new buildings.

The surplus revenue of the Patent Office applicable to building purposes amounts to 129,000*l.*; and as this amount is clearly derived from the pockets of inventors and patentees, it is plain that their convenience, as regards locality at least, should be a primary consideration. Still, as the Arabs say, "a "sparrow in the hand is worth a flock of "cranes in the air;" and if Fife House and gardens are to be had at once, we prefer having them, to entering into a seven years' discussion about some other site.

We are told that the Crown leases of Fife House, and the several buildings adjoining it, have lately expired, and that therefore the whole property is now at the disposal of Her Majesty's Commissioners of Woods and Forests in right of the Crown. This simplifies matters much, undoubtedly, and perhaps justifies the prayer for the appropriation of the site to the purpose named. The Commis-

sioners who append their names to the report, which is illustrated by a plan, are the Lord Chancellor, Sir John Romilly, Sir William Atherton, and Sir Roundell Palmer.

PETROLEUM.

Petroleum, which is now the subject of much discussion, has been for the past two years a new and profitable branch of Canadian enterprise. In less than six months New York has exported upwards of 2,961,317 gallons, about half that amount from Philadelphia, and between Baltimore and Boston somewhere about 228,000 gallons, which have been forwarded to almost all parts of the globe. England, however, has been the greatest consumer, having received 2,000,000 of gallons alone. A merchant in one of our large seaport towns states that this country absorbs about 42,000,000 gallons per annum; and he has even ventured to assert, that if the rocks and wells of Pennsylvania, Canada, and other districts, continue their exudation at the present rate of supply, the value of the trade in this ore may equal the cotton trade of America. Paraffin oil (which is the English name of refined petroleum) has had a great demand, no less than 500 tons having been sold weekly. Lubricating oils, wax for paraffin candles, naphtha, and benzole, from which the new and fashionable dyes are obtained, can be had from petroleum; and it is asserted that its uses may be extended to spirits of turpentine for painting.

The country from which this rock-oil is obtained embraces a vast extent of the American continent. Oil springs have, however, been sunk in but few localities as yet, and many of these have been abandoned in consequence of richer wells being discovered, which can be worked at a less expense. The pumping apparatus used consists of a small horizontal engine, which is connected by its pitman to a crank, and gives motion to a vibrating wooden beam, one end of which is attached to the vertical pump-rod in the well, which receives a reciprocating motion that operates the plumb plunger and lifts the oil. It is said that a coat of this oil has covered the surface of the river for seventy miles, which, when the sun shines upon it, reflects in beautiful green, crimson, and orange—their prismatic hues. Petroleum is sold in Pittsburg at the low rate of sixteen cents per gallon.

As to the origin of this oil, there are many conflicting opinions. It has been supposed to be of vegetable origin, produced by subterranean heat, but the more accepted opinion seems to be that it is derived from bituminous shales, situated below the coal formations. These bituminous shales have yielded enormous quantities of oils; but petroleum is not always found in this class of rock. Another opinion has been given that it has its origin in coal-beds—that a low heat in the coal-seams drives off hydrocarbon vapour, which is condensed in the pores of the rocks and the soil, and is washed by rains into subterranean recesses, which are situated at various depths in the rocky strata. There seems, however, every reason to conclude that these oils are both found in the bituminous shales as well as in the coal-beds. In the Mediterranean the island of Zante has been known to possess two springs of oil, which have been opened for 2,000 years; and it may fairly be conjectured that these oil springs of the new continent will afford an abundant supply of petroleum for many years likewise.

Two gentlemen of Philadelphia have made a series of experiments in order to form an estimate of the comparative illuminating power of petroleum, and they find that one gallon equals four of other burning fluid in giving a good light. They have also found that the best way to burn this oil is to have a clear straight cut of the wick; and that with a flame from a wick cut straight across, 2,576 gallons of oil gave a light equal to 1,000 cubic feet of gas, while with an arched flame 2,846 gallons of oil were required. It has been found, from experiments by the same gentlemen, that 35·53 lbs. of paraffin candles were required to produce a light equal to 1,000 cubic feet of gas; 41·16 lbs. of spermaceti and 47·18 of adamantine. It may be well worth notice here, that a great loss of light results from permitting beads of smoke to accumulate on the ends of candle-wicks.

Public attention has been repeatedly called to the explosive character of petroleum. We have, in the Mechanics' Magazine, given several accounts of the testing of the inflammable properties of this oil. The Insurance Companies made a stir about it before the Lord Mayor some few months ago. They stated that petroleum was in the highest degree combustible, and threw off an inflammable explosive vapour at ordinary temperature, and even at a very low temperature. They had made an experiment on a cold wet day, and found that it ignited on a light being held to it an inch from the surface. It floated, they said, and would not mix with water, and, being exceedingly volatile, it spread rapidly over the surface of water, burning fiercely when ignited. They complained that as there were alone on the Thames about 210,000 gallons of this oil, the property along its banks remained in daily jeopardy. The Lord Mayor had not the power to put down the storage of this dangerous material, but advised the deputation that awaited on him to petition the Legislature to regulate its introduction and use. Last week, at Liverpool, the town functionaries made a series of experiments, which have convinced them that the storage of this inflammable material in so large a town is a questionable procedure. We would commend to their notice the decision of New York respecting the matter, and urge them to take some steps to remedy any forthcoming evil. The Legislature of that city have prohibited the storage of this oil except in buildings suitable for the purpose, and in places where life and property are not likely to be endangered. The law in this country provides that all combustible materials—such as gunpowder, fireworks, naphtha, &c.—shall only be deposited in such quantities and in such places as shall render them of no danger to public life or property; and this law may be carried out equally with regard to petroleum. The experiments made at Liverpool leave no doubt in our minds that petroleum is a very dangerous oil, and, in case of an explosion, it would with great difficulty be got under. Professor Eaton, of New York, however, has stated that petroleum is not liable to spontaneous combustion, and several eminent chemists of America have agreed with him. He states that the light gas which evaporates from the crude material on exposure to air is vaporised naphtha; that no benzine proper is obtained from it; that the article called benzine, said to be distilled from it, is not true benzine; and that various oils obtained from petroleum have not been named by chemists.

We cannot dismiss our subject without referring to a laughable incident recently enacted at Liverpool, where, as our readers know, great excitement has for some time prevailed, in consequence of extensive storage of petroleum. A memorial had been presented from upwards of 1,000 inhabitants of Toxteth Park, complaining of the storage in that vicinity, as a nuisance; but a counter-memorial had been signed by a number of firms, stating that 30,000 barrels had been housed in Liverpool without accident. Just as the Town Councillors were assembling on the 6th of this month to consider these complaints, a man passed by and let fall, evidently for the benefit of the thousand memorialists, a jar containing this oil. The jar was, of course, shivered, and the man, having effected his purpose, ran away. The Councillors who had assembled inside rushed out of the hall to satisfy themselves as to the scent of petroleum, and were disgusted with the suffocating odour which was emitted from the jar. Evidently this incident had some importance in their decision, for we find that they declared that the oil was intolerable and dangerous to health, and, furthermore, was innocuous. Ultimately, however, they decided to refer the subject to the Health Committee.

IRONSTONE AND COAL-MINING IN A SANITARY POINT OF VIEW.

The report of the medical officer of the Privy Council, which examines the trades and occupations of Wolverhampton from a sanitary point of view, contains several important details worthy of attentive consideration. Everyone knows that the Wolverhampton district has many coal and ironstone mines. Sometimes these mines are found in juxtaposition to each other, and yet belonging to the same owner. As the miners do not work exclusively in either kind of mine, it would be impossible to ascertain the proportion in which the mining operations of the district contribute to produce the excessive mortality from pulmonary disease. The medical officer, however, assumes that, judging on the one hand from the prevalence of irritative pulmonary diseases among quarrymen and stonemasons, and on the other hand from the singularly low rate of mortality from these diseases in certain of the Durham colliery districts, he may consider that ironstone mining is more prejudicial to health than coal mining. The reasons for this state of things might, perhaps, be found in the defective ventilation of the mines, and the diffusion through the atmosphere of impalpable dust, and of the smoke and other products of the combustion of gunpowder used in blasting the mineral.

The report speaks in very disparaging terms of the condition of the mines of the town. It says:—"The greater part of the mines in "the Wolverhampton district are of small extent, employing but few hands, sometimes "not more than eight or ten. The mineral of "the district is nearly exhausted, the whole "country being, so to speak, riddled by mining "operations; and the surface of the earth for "several square miles presents the appearance "of a black waste of shale and refuse, interspersed with tramways, pools of water, and "the machinery necessary for working the "pits, varied here and there by the blast furnaces and other buildings connected with "iron works. The undermined state of the "country is shown by the great number of "ruined and misshapen houses caused by the "shrinking of their foundations. So frequent, "indeed, are the disturbances of the surface "from this cause, that roadways, canals, gas-"pipes, and drains are continually being "damaged by the displacement of the surrounding earth consequent upon the sinking "down of the roof of wrought-out mines."

The ventilation of the mines of Stafford-

shire, and, indeed, nearly the whole of the larger mines of the northern counties, is very deficient. On certain occasions, the atmosphere of the mine will be stagnant, or the direction of the currents so uncertain as to make the pits very dangerous to human life. A large furnace is constantly burning at the foot of that through which the outward current of air is intended to pass, which rarefies the air within the shaft, and "causes it to "ascend rapidly into the external atmosphere, "whilst a powerful current of air sets in to-"wards the furnace from the workings, in lieu "of which fresh air is drawn into the mine "by the 'down-cast shaft;'" but this has failed to convey fresh air to the innermost part of the mine, as the air will find its way by the most direct route from the point of entrance to that of exit. This defect, however, is obviated by a number of partitions, doors, and other means, which have the tendency of guiding the current of air in the direction that may be required, and so arranging it that one part of the current may pass up one, and another part up a different, roadway. By this means, though it is in a very tortuous manner, pure air is conveyed into every part of the mine, even up to the faces of the men, in order that the gases disengaged from the strata may be swept away. To this excellent arrangement may be attributed in no small measure the lack of those diseases which are engendered by imperfect ventilation; and the medical officer himself states that pulmonary complaints and premature death are often the issues of a want of proper attention to this consideration. The mines of Wolverhampton are known to be ill-ventilated, and the reason may be found in the fact that, the minerals being nearly exhausted, this complicated mode of ventilation is impossible, because of the expense it would necessarily entail. The coal and ironstone mines of the neighbourhood of Wolverhampton are furnished with what is known as the "down-cast" and "up-cast" shafts, but they lack the furnace to which reference has been made, which, if employed, would rarefy the air. Consequently, notwithstanding other precautions, the ventilating current is uncertain and fickle. When a stagnation of the air occurs, the remedy is resorted to of suspending from the top of the "up-cast" shaft an iron basket of fire, which, in small mines, has, though to a less extent, the same beneficial tendencies as the more expensive and decidedly superior mode of ventilation in the Northern mines. Though the imperfect ventilation of the mines of this town is a fact that has been attested by Her Majesty's inspector of mines for North Staffordshire, and confirmed by various gentlemen of position in Wolverhampton, the mines of that town are not all subject to the same censure. We learn from the report before us, that in some of the mines the up-cast shaft is arched over at the top, and by its side, on the surface of the earth, is a closed furnace, dependent on the shaft for its supply of air. This has the effect of causing a considerable draught of air through the shaft, which, in passing through the furnace, finds its way out by the chimney, and must be replaced in the mine, by the admission of fresh air through the "down-cast" shaft. We are told that "in other cases, a tube, fitted at the "upper end with a movable funnel-shaped "cowl that shifts with the wind, is conveyed "from some distance above the surface of the "earth to the bottom of the shaft, and even "sometimes into the recesses of the mine, by "means of a tube joined at right angles to the "descending tube." Of all these plans, however, the best is considered to be an indifferent substitute for the one we have described, which is more costly, but a much more effectual system of ventilation.

Having shown the want of sufficient ventilation in the small mines of this district, the report proceeds to consider the effects of this state of things upon the miners. As we stated at the commencement, the miners do not work exclusively in either the ironstone or coal mines—sometimes alternately working in both; consequently, the medical officer cannot possibly ascertain the exact proportion of the deaths from consumptive diseases. However, there is, unfortunately, sufficient evidence of the injurious influence on their health from their occupations. There is a great prevalence of chronic bronchial affections and of phthisis among the miners, which the resident medical practitioners have attributed in a great measure to the miners' employment, as well as in part the cold bleak climate of the district. Asthma is also a common disease, and is principally caused by the miners working in damp clothes. Out of twenty-five persons who were examined by Her Majesty's Inspectors, nearly all of whom belonged to different mines, only four stated the occupation of mining to be a healthy one; and two of these qualified their statement by saying, that men who work in mines that contain much damp are liable to suffer from dyspnœa, cough, and expectoration. The remaining twenty-one agreed in the opinion that both coal and ironstone miners are more liable to suffer from asthmatical disease than other people. The report concludes by stating that it was found more difficult to meet with broken-down miners for the purpose of examination in the Wolverhampton district than in the mining districts visited and reported on last year; but such as were examined were found to be suffering from the same class of ailments as the Cornish and lead miners. Chronic bronchitis and its results are the complaints to which the Wolverhampton miners are subject, but the disease appears to be slower in its progress than is the case among tin, copper, and lead miners. A greater proportion of the Wolverhampton miners likewise escape the disease, or suffer from it in a mitigated form, and there is a greater tendency to recovery after ceasing to work in the mines. Several old miners were seen, who, having ceased to work under-ground in consequence of miners' asthma, had in a great measure recovered their health, and were able to follow some light occupation on the surface of the earth.

We conclude our notice by recommending this question, which is of essential importance to the health of a great number of able-bodied colliers, to the careful consideration of those who are the proprietors of mines in the district of Wolverhampton, and incidentally to those of other districts whose mines are deficient of proper ventilation.

THE INTERNATIONAL EXHIBITION.

THE PROCESSES COURT.

THE Processes Court has been for some time becoming more attractive day by day. It is likely, that had the Commissioners foreseen that it would be so popular, they would have given it more space in a better position. It is hemmed in on one side by the Hardware Court, and on the other it is almost thrust under the stairs of the Picture Gallery. Of the many persons who pass through it, most of them stumble upon it by accident, and there are many thousands who leave the Exhibition without having seen it at all. The visitors, both gentle and simple, are much interested in the handicraft operations which are to be seen in this Court. Lithographic and steel-plate printing, velvet weaving and medal cutting, tobacco-pipe and pencil making, have inquisitive spectators watching them all day long. The sewing machines, too, are numerous in this quarter, fourteen being exhibited, and eight in constant operation. It is likely that, when they are understood better, and become cheaper, the sewing machines will be the implements of labour in all industrial occupations where the needle is the principal tool: hence the curiosity with which they are inspected by many who are amazed to see fabrics put together with a rapidity and a neatness which our mothers, not to speak of grandmothers and more remote maternities, would never have dreamt of. Most of them have an ingenious contrivance by which they lay down a hem as neatly as ever the mistress of a dame's school could have laid it down for her young disciples, and will sew it as firmly as ever dame could have desired, and far more neatly.

The machines exhibited in the Processes Court are all of English manufacture. Some of them avow their American origin, while others claim English improvements, which merit the name of inventions. It would be needless to describe them all in detail, but we give the names of the various exhibitors:—

BRADBURY & Co., Oldham.
W. CARVER, Manchester.
FERRABEE, High Holborn.
GUINNESS & Co., Cheapside.
M'KENZIE & Co., Glasgow.
M'KERNAN, Cheapside.
NEWTON, WILSON, & Co., High Holborn.
PEARSON & Co., Leeds.
SALISBURY, Coventry.
SERVICE, Mitcham.
SIMPSON & Co., Cheapside.
SMITH & Co., London Wall.
THOMAS & Co., Newgate Street.
WHIGHT & MANN, Holborn.

The machines of Mr. Thomas are the oldest and best known in this country, at least in London. They are manufactured in various sizes, adapted for different kinds of work, and are extensively used by army contractors, by the Military Clothing Establishment at Pimlico, and in the manufacture of shirts, collars, stays, sacks, harness, &c. It was generally believed that, as Mr. Thomas had purchased the machine and patent of Howe in 1846, the machines he has vended since were those of Howe's invention; and we must confess that we shared in that belief. Mr. Thomas claims, however, to have invented and constructed an entirely new machine, differing essentially from the one purchased by him from Howe. There is certainly a difference in the means by which the tension on the needle thread is regulated, and an ingenious contrivance under the needle-arm apportions the quantity of thread drawn from the reel to the thickness of the material to be sewn. But the most obvious difference is in the feed motion. Howe's machine has a wheel-feed underneath. The machine of Mr. Thomas has what is known as the upper feed. This upper-feed motion has been long since abandoned by all American machinists, as being in no way comparable to the four-motion feed, the invention of Mr. A. B. Wilson. Mr. Thomas's machines, however, from their solid construction, are well adapted for heavy work and extensive manufacturing, for which purposes they are largely employed.

Mr. Carver has two machines here almost identical in their construction with Mr.

Thomas's, and they have certainly been the most productive of any machines in the Exhibition. They are worked by two young women, one of them a mere child, in fact, and they have turned out nearly 2,000 pairs of trousers, or somewhere about twenty pairs a-day, since the opening of the Exhibition.

Mr. Salisbury exhibits a machine which is so far a novelty in that it carries a bobbin underneath, instead of a shuttle. The bobbin is made to perform half a revolution, and then return, when the slack thread it casts off is caught up by a hook and twisted round the thread carried down by the needle, by which means a knot is tied at every stitch. The machine is called a "knot-stitch machine," and the security of the stitch is indisputable. Should one stitch be cut, the one lying next it is protected by its knot, and can only be undone by cutting it also. For all kinds of heavy work the machine has a peculiar excellence, and deserves more notice than it has yet received.

Messrs. Newton & Wilson, of High Holborn, make an excellent display of work performed by the sewing machine, in which it were difficult to say whether most credit is due to the machine or the operator. Their machine is a chain-stitch, known in America as the Grover and Baker machine, in which the vertical needle is employed, but, instead of a shuttle, it is accompanied by a second needle of a circular form, with a backward and forward rotatory motion on a horizontal plane, and carrying, through its outer eye, the thread coming from a bobbin, which may be of any size whatever, like the one which feeds the vertical needle. The relative motion of those two needles is so complicated that it would be impossible to give a proper idea of it without diagrams. There results from it a double chain-stitch, in which the successive loops of the upper thread are traversed and embraced by those which are made by the lower thread, so as to unite solidly two pieces of cloth. The stitch of this machine it is not easy to pull out; and, although it forms a seam a little raised, through the interlacement of the loops, it presents very ingenious combinations. It works with great rapidity, and is almost noiseless in its operation—prime qualities in a machine intended for family use. For several years Grover & Baker have been turning out their machines at the rate of fifty per week. They obtained a second-class medal at the Paris Exhibition, and were used by the French Government at their establishment for the manufacture of military equipments.

Guinness & Co., of Cheapside, exhibit the most recently-patented machine, remarkable for its neatness and simplicity of construction, and which might be fitly described as a machine without any machinery. It is a shuttle machine, worked without cams, by an equal crank motion, one shaft working three cranks—one for the shuttle, one for the needle, and the other for the feed. By this equable motion, the needle does not rest while the shuttle passes through the loop, as in other machines; it may therefore be worked either backward or forward at pleasure, securing the thread at the end of each seam without the help of hand-work. The needle-arm works on perpendicular rods, using a straight needle, which, requiring no oil, promotes the cleanliness of the operation, and avoids the liability to soil the work, which has been an objection to some other machines. The machines now exhibited by this firm are specially adapted for family use; but they are constructing others on the same principle for manufacturing purposes, which we have no doubt will enter powerfully into competition with those now in use. We have already hinted at cheapness: let us here remark, that simplifying the mechanical construction of the sewing machine will but accomplish half its purpose, unless it is thereby greatly reduced in price. It will be in vain to look for it as an indispensable adjunct to the household laboratory till it is brought within reach of the bulk of the community.

Guinness's machine is the only one in the Processes Court which has been recognised by the Jurors, and to this they have awarded "Honourable Mention." It is with some show of reason that the Exhibitors here complain of the Jurors having unfairly judged the machines of English manufacture. All the American, and most of the other foreign machines, have received an award, and it is singular if there was not sufficient merit in those of the United Kingdom to entitle any of them to the distinction of a medal.

R. E. Simpson & Co., of Cheapside and Glasgow, have got an enviable position in this Court, and make an excellent display of their machines. We have here also a shuttle machine, the chief difference in which, from those we have already described, being an underfeed motion on each side of the needle, by which, it is said, the material to be sewn can be turned or curved with greater facility. The appliances by which the machine is worked are cased in, preserved from dirt and injury, and giving to the whole a very neat and compact appearance. They are finished, too, with more care than the generality of the English-made machines, and evince a superiority in this respect which can be seen at a glance, and which is highly creditable to the Glasgow artificer.

Messrs. Whight & Mann, of Holborn, show a small machine, which makes a chain-stitch like the Grover & Baker, but which the exhibitor terms a double loop. Here we have a different feed motion from any of the others; that is, a needle feed, in which the needle, attached to the disc of a small wheel, is made to describe part of a curve, and in penetrating the cloth moves it forward at every stitch. One can see that this kind of feed can only do with very light work, such as light and nimble fingers can effect. But every machine that we have seen is only adapted to its own special work. The machine that shall do every kind of work, and do it well, has yet to be invented.

THE TRUE PRINCIPLES OF AIR NAVIGATION EXPLAINED.

TO THE EDITOR OF "THE MECHANICS' MAGAZINE."

Sir—The achievements of modern science prove the impossibility of man setting bounds to human ingenuity, and the achievements of flying animals prove the practicability of a science frequently testing man's ingenuity. But how unsatisfactory the result terminates, if, in the hope of gleaning any useful information practically available for realising the navigation of the air, we review any of the numerous schemes and suggestions which have been proposed, even by men of very creditable reputation! This result undoubtedly arises from the fact that so many have been influenced in their endeavours to accomplish it by the buoyancy of a substance of *much less density* than the air. Others have been equally unsuccessful through the difficulty of obtaining an adequate motive power without excess of weight; the consequence of which is that, because they have all signally failed, we feel warranted in concluding that its achievement by man is utterly impracticable: so that if anyone proposes an additional scheme we are prone to condemn him at once as "only plodding over well-trodden ground." But, notwithstanding that this subject has hitherto baffled every effort, it may yet be well to pause before condemning it as hopelessly impossible, and endeavour to inform ourselves correctly of the principles upon which the success of flight depends, and the manner by which they are developed in the actions of all flying animals, all of whom are formed of materials of *much greater density* than the air; and their successful example, though natural, clearly demonstrates its practicability by artificial means. Consequently, in an invention of this nature, it becomes preeminently necessary to obtain a correct knowledge of the principles adapted by the Creator for sustaining all flying animals; for by the adoption of those principles only which are most true to nature can we hope to succeed practically in navigating the air. The difficulty of obtaining this knowledge is, however, somewhat considerable, because it demands the closest observance of the actions of flying animals during their flights, and the rapidity with which such actions are performed often eludes the keenest watchfulness: also it is often extremely difficult to interpret correctly the operation of even the simplest law of nature. By carefully examining the formation of their wings we may derive great assistance, although the mode of operation has been greatly misconstrued; for all writers assert that the action of the downward stroke alone produces the upward and onward effect. By one it is thus stated:—

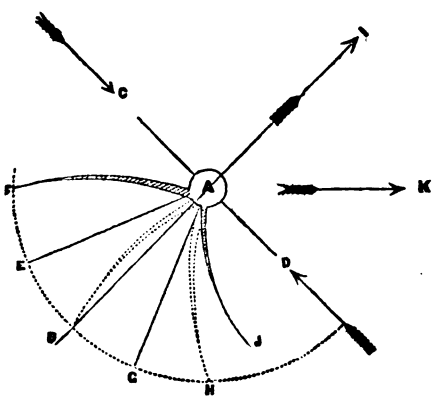
> The stroke of a bird's wing is always perpendicular, and this *one action serves both to sustain and to propel*. This is a result as well of the structure of the whole wing as of the structure of each feather. The feathers are all so placed with reference to each other that in the upward stroke they tend to separate and allow the air to pass between them; while in the downward stroke they are pressed against each other so as to present to the air one impervious expanse, and thus to secure the greatest possible amount of atmospheric resistance. But the most beautiful part of the structure is that which converts the stroke for sustaining into a stroke for propelling also. The quills are so set that the elastic ends constitute the terminal and posterior margins of the wing. The anterior margin of the wing is rigid—being that containing the bone. The consequence of this arrangement is, that the air compressed by the downward stroke escapes backwards, bending upwards in its passage the fine elastic tips; and thus exerting an upward and onward re-action on the whole body of the bird.

The fallacy of this argument is in asserting that "one action serves both to sustain and to propel," and also "that the air compressed by the downward stroke escapes backwards, bending *upwards* in its passage the fine elastic tips." Had such a result been intended it evidently would not have been guarded against by the Creator, who, in order that the feathers may resist the more firmly every tendency to bend them upwards, has imparted to them a downward curvature of such tenacity, that even the entire weight of the bird is insufficient to bend them outwards during life; and, further, it possesses the power of increasing and maintaining the curvature of the feathers at will, because all the atmospheric resistance derived from the downward stroke is fully required, or nearly so, to support the body in opposition to the gravitating influence of the earth.* The downward stroke is therefore solely designed for elevating and sustaining the bird, the curvature imparted to the feathers and structure of wing enabling it for that purpose to retain to the utmost its hold of the air throughout the entire stroke, and thus prevent it from escaping backwards. Moreover, it is evident that during the time in which the momentum derived from the downward stroke is being neutralised by gravity, the animal performs the upward stroke, and throughout this action the air offers a resistance against which the elastic edges, unable to retain their former expanse, instantly bend (down-

* The cruel practice of clipping birds' wings is a proof that the wounds so inflicted are such as to render them incapable of flight, because they cannot sufficiently curve them afterwards; if they could, a slightly increased velocity of a reduced surface would produce the same result from the same power, and which could be applied by the bird, because its power would not be reduced by shortening the feathers if no pain was endured.

wards), and, by this simple provision, such resistance is thrown or impinges on the anterior margin of the wing below its centre, and produces the onward propelling effect. It is probable, however, that when the body has an oblique direction to the line of motion (as when rising or settling, or as the body of some insects have during their actions), the atmospheric resistance is caused by the elastic structure of, or by slightly changing at the end of each stroke the position of, the wing, to impinge alternately above and below the centre of its arm, so that the reciprocating actions in this position produce most equally an upward and onward effect throughout each (not one) stroke. Whereas, when the direction of the body is horizontal to the line of motion, each stroke in that position participates in the progressive motion most unequally—the upward stroke contributing chiefly or entirely to propel the body, and the downward stroke contributing chiefly or entirely to sustain the body.

The annexed diagram illustrates the reciprocating action of the wings or propellers:—



Let A represent the arm or anterior margin of the wing, B A the plane or surface of the wing (dotted), C D and D C the direction of the reciprocating actions or strokes. Now if the position of the propeller is changed from B to E, or, being elastic, the resistance offered to the downward stroke will give the surface the position as at F, and be thrown or impinge on the arm of the propeller at its conjunction at A, and remain on the same side of, and above the, centre B I, throughout the entire stroke from C to D; exerting an upward and onward reaction on the arm. If, when the downward stroke is performed, the propeller take the position at G, and, being elastic, the resistance offered to the upward stroke (against which the elastic edge, unable to retain its full expanse as at H) will cause the curvature to take the position as at J, and the resistance in this action will impinge and remain below the centre of the arm B I, and produce an onward and upward motion throughout the stroke from D to C. From these reciprocating actions it is evident that, so long as the motive power impelling the wings, and the elastic force or density of the air resisting the surface of those wings, exceeds the weight or density of the body to be raised—or, which is the same thing, the force of gravity—the line of motion will be in the direction from B to I; and when the atmospheric resistance on the surface of the propellers and the gravitating influence of the earth on the body are equal, the line of motion will be in the direction from A to K, or horizontal; and by increasing or decreasing the motive power a change of altitude will be attained. (Of course with birds, and probably insects, this change is effected by their tail, and often when the action of their wings is altogether suspended.)

As this reciprocating action is performed between one or more pairs of propellers, the direction of the current of air thus set in motion by each propeller is met, resisted, counterbalanced, overcome, and reversed, by the action of the opposite propeller. This sudden and continually changing of motion of the current of air by the propellers causes additional compression of the air in the direction of that motion, and thereby developes that remarkable property of air, its elasticity, i.e. the property of resisting compression, which makes the incredible difference between the resistance experienced by surfaces when set in motion circularly, or projected longitudinally, or when acted upon by the air in motion; and the resistance, or rather the impact of the air to surfaces when set in motion, as in the action of any flying animal.

The following is one result of several experiments with two pigeons, conducted expressly for ascertaining the strength and weight of the birds and the surface of their wings, and for obtaining as a basis correct and reliable information respecting the resistance offered by the air to a given surface propelled in the manner and at a velocity common to birds. For although the velocity with which they work their wings is rapid, it does not, during the most violent exertion, exceed three actions per second, being limited to such as can be repeated and maintained with perfect ease to the animal; and although in some instances the eye can scarcely distinguish the strokes, in others they can be distinctly counted, as in the flight of rooks, whose slow movements do not exceed or even reach at times one action (consisting of the upward and downward strokes) per second. They also will often suspend all action of wing entirely for upwards of eight seconds at a time, and during such suspension will sail a considerable distance, and even then also rise higher from the momentum obtained.

Experiment with Male Bird.

The weight of this bird was 7,270 grains troy = 1·04 lbs. av.
The weight of greatest load, 5,303 grains troy = 0·76 lbs. av.

The total weight lifted 12,573 „ „ 1·8 lbs. av.

The surface of wings equal to 83½ square inches. At 6 inches from the centre of back, being midway between back and tip of wing, the wing was 4½ inches wide; the average length must therefore be taken at 9¼ inches (the greatest length being 12 inches), which multiplied by the width gives 41¾ square inches as the surface of each wing.

Experiment with Female Bird.

The weight of this bird was 5,356 grains = 0·77 lbs. av.
The weight of greatest load, 5,303 grains = 0·76 lbs. av.

The total weight lifted 10,659 „ 1·53 lbs. av.

The surface of wings equal to 70 square inches. At 5¼ inches from centre of back, being midway between back and tip of wing, the width was 4⅜ inches; the average length must therefore be taken at 8 inches, which gives 35 square inches as the surface of each wing.

Experiment with Insect—a Blue-bottle Fly.

The weight of this insect was 1¼ grains, with greatest load 2¼ grains; the surface of wings 0·125 square inch.

Having therefore the weights of these bodies and the surface measure of the propellers by which such weights were raised and supported in air, we have now to find the *true* velocity required of such surfaces to raise their respective weights.

Fig. 1.

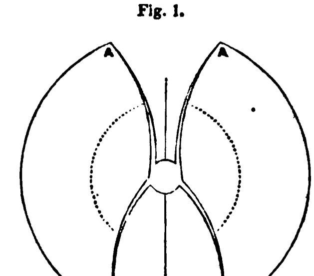
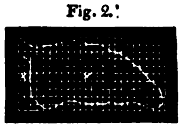


Fig. 2.



In the above diagram, fig. 1 represents the size of the natural wings (male bird's) in their raised and depressed positions, and fig. 2 an outline of the surface expanded as when in action, and the mode of measurement adopted. They are reduced to one-sixteenth of the original.

Birds when flying seldom elevate or depress their wings so much as to bring them in contact either above or below the body: in most instances they are not passed through an angle greater than 90° on each side. The above diagram, however, represents the stroke of each wing, commencing at A A and terminating at B B, as being propelled through an angle equal to 135°, and the dotted circle represents the distance through which the whole surface of the wings are propelled, the diameter of which must be equal to the length of one wing. The male bird's wings being each 9¼ in. long, gives that distance as the diameter of such circle, the circumference of which is equal to 29·06 in. If the wings are propelled through 270° of this circle, we have 21·8 in. as the distance through which a surface equal to 41¾ square in. is propelled at each stroke (or twice that surface through half the distance) to raise a natural weight of 1·04 lbs., and when loaded 1·8 lbs. What, then, is the required velocity of such propellers? A surface equal to 41¾ square in., if propelled at a velocity equal to 52·5 feet per second, or 35·8 miles per hour, will, according to the rule given by Playfair, meet a resistance equal to 1·8 lbs.; and when propelled at a velocity equal to 45·5 feet per second, or 31 miles per hour, will meet a resistance equal to 1·04 lbs. In the second experiment (female bird) the surface employed to raise its natural weight of 0·77 lbs. is equal to 35 square in., which, propelled through an angle equal to 270° of a circle 8 in. in diameter, gives 18·8 in. as the distance through which such surface is propelled at each stroke; and the velocity required according to the above rule ($S \times V^2 \times \cdot 0023$) is 37·5 feet per second, or 22 miles an hour, to obtain a resistance equal to 0·77 lb.; and 53 feet per second, or 36 miles an hour, to enable it to lift 1·53 lbs.

From this we may readily ascertain the number of strokes, required by the rules generally established, which each bird must perform to raise its natural weight and load:—

Surface of wing	Space propelled through at each stroke	Velocity (Playfair's rule)	Number of actions per second required of bird	To raise its natural weight, also weight and load
Square in.	In. ft.	Feet per second / miles per hour		lbs. avoirdupois
Male bird 41·75	21.8 = 1·82	45·5 or 31 52·5 „ 35·8	25 29	1·04 1·8
Female bird 35	18·8 = 1·57	37·5 „ 22 53 „ 36	24 34	0·77 1·53
Insect 0·125	0·75	3·3 „ 2·25	53	1·25 grains

This table shows that the male bird, in order to raise its natural weight of 1·04 lbs., must make 25 actions, or 50 strokes of its wings per second, and propel a surface equal to 41¾ square inches through a distance of 45·5 feet! and the female bird must make 24 actions, or 48 strokes, of its wings per second in order to raise its natural weight of 0·77 lbs., propelling a surface of 35 square inches through a distance of 37·5 ft. in one second!

That the application of any such rules as the above to the subject under consideration is monstrously erroneous, must be apparent to anyone who will take the trouble to notice for a few minutes the actions of these animals during their flight, as he may not only distinctly see the movements of their wings, which he could not do if

they repeated these actions only four times per second, but even perceive them suspend all action of wing entirely for several seconds at a time, and during such suspension to rise higher or change their course at will.

I will conclude what I have to say on this subject in another letter.—Yours, &c.,

W. Quartermain.

TONNAR'S IMPROVEMENTS IN DRYING AND CLEANSING MALT, &c.

Fig. 1.

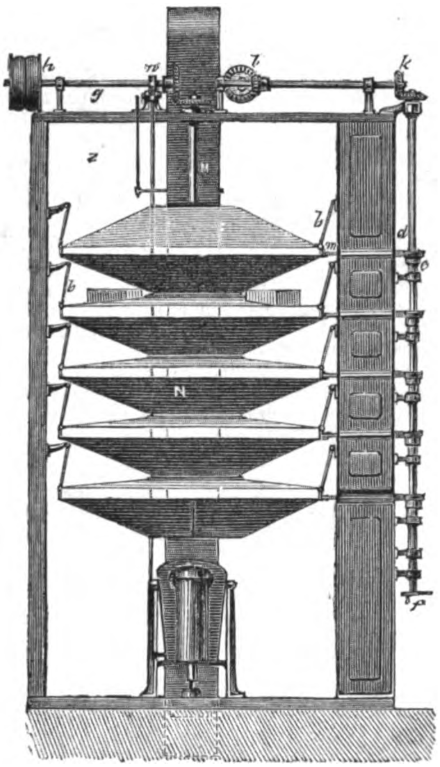
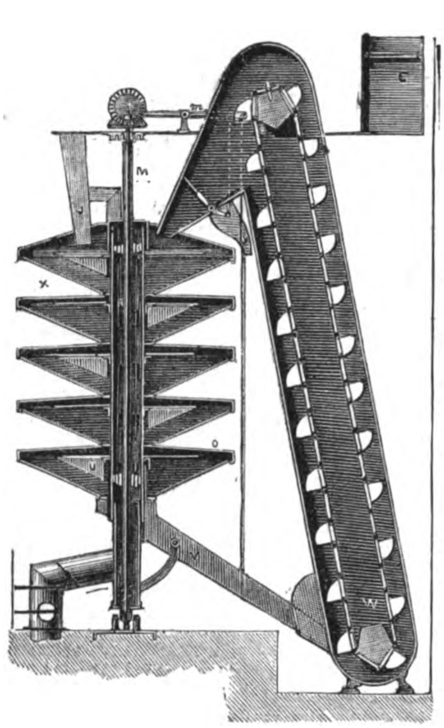


Fig. 2.



Monsieur A. Tonnar, of Eupen (Rhenish Prussia), has just obtained a patent for "Improvements in the method of and apparatus for drying and cleansing malt, as well as any other species of grain and seed intended for brewing, distilling, and agricultural purposes."

This invention has for its object the drying and cleansing of malt and any other grain and seed in a more perfect manner than has hitherto been effected by kilns, frames, or any of the ordinary modes.

The green malt or other matter to be dried and cleaned when taken from the airing granary, is poured first into a receiver having three compartments with openings at the side, and a bottom formed of metallic network or sheet iron pierced with holes, under which the heat is supplied. The receiver is connected to a shaft or axis, and is turned until one of its side openings corresponds with a funnel, by which the malt, heated and partially prepared in the receiver, is poured upon the first of a series of discs fixed to a tube connected to a shaft, which is made to revolve. In some cases the receiver is dispensed with, and the malt from the airing granary is passed at once through the funnel to the discs, which revolve in baskets, the lower parts of which are shaped like a funnel, and composed of metallic network or perforated iron plate. Each cover of the basket is provided with two openings, having over them metallic network. The discs have small wings, which jerk the malt, grain, or seeds, against partitions placed laterally in the baskets, and the damp air escapes through the network openings at the top.

There are two large ventilating wings for distributing the heated air on the descending malt and expelling the damp air. This operation is performed in each basket, after which the malt or other grain is conducted by a jolting spout to an elevator, by which the matter is conveyed again to the upper disc, and the operation repeated as often as required.

When the malt or other matter is sufficiently dry, the upper spout of the elevator is closed and a conductor opened, through which the malt passes from the machine.

The lower part of the baskets may be made of sheet iron, and the covers and sides made of metallic network. In this case the jolting spout is perforated, and also the bottom of the lower basket, for providing the means of sifting. These arrangements may be still further modified by making the cover, sides, and a portion only of the lower part of the basket, of metallic network or perforated sheet iron; in this case ledges or slabs are provided to prevent the waste from falling on the lower basket.

The jerking or projection of the malt by the centrifugal force against the partitions in the baskets, divides it from the radicles that are still damp, and the concussions and also the ventilation expel these radicles and all other impurities out of the machine through the meshes of the network.

This invention consists not merely in the apparatus, which is susceptible of modification, but in the peculiar system combining the employment of centrifugal force for putting the grain in motion, for dividing and separating from it the waste, for the distribution of the heat, for clearing away the damp air, and for the ventilation and sifting.

The manner in which the invention is to be performed will be understood by referring to the above engraving.

The malt which is to be dried and cleansed by the machine being previously deposited on the cooling granary, is first placed in the receiver. The bottom of the receiver is made of perforated plate iron, or of metallic cloth, and the heat is brought under it through a pipe provided with a valve. The receiver moves round its axis, and is turned until one of the openings corresponds with the funnel or hopper J, by which the warmed malt prepared in the receiver runs into the machine, and falls on the plate iron disc or sheave K, fig. 2. The discs K are fixed by the rings L to the tube R, fixed itself on the axis M, by means of the cast iron pieces. There are five similar sheaves on the same axis at equal distances from each other, and turning in five funnel-formed baskets N, the lower part of which, as well as the upper part of the top basket, are composed of metallic cloth, or of perforated plate iron. The covers O of the lower baskets are made of plate iron, and have two openings covered with metallic cloth. The sheaves K are put in motion by the axis M, and are provided with the small wings which serve to project the malt or other produce against the lateral partition of the baskets, whilst the ventilation that results from it drives the moist air through the openings. Small iron plates fixed under the sheaves serve to separate the malt whilst descending into the baskets, and the large ventilating wings U serve to distribute in an equal manner the heated air on the malt that descends, and so drive away the moist air which collects in that part of the baskets. The same operation is repeated in each basket, after which the malt is conducted by the spout or hopper V to the elevator W, which brings it again to the upper sheave K. As soon as the malt is sufficiently dried, the valve X is lifted in the direction marked by the dotted lines, and this compels the malt to fall into the tube Y, through which it is carried to any place near the machine. The machine may be composed of a greater number of baskets, and their dimensions vary according to the locality and the work to be produced. The baskets N, which are independent from each other, are eccentrically suspended by the rods *b*, fig. 1 (in form of hinges), at the supports C of the machine; their vibrating or shaking motion, which is to make the malt descend in the baskets, and to cleanse it, requires to be stronger on green malt with its radicles than on the drier malt from which the radicles have been removed, and this force is regulated by placing the eccentric thumbs *e* which produce the shakings at different depths by means of the screw E, which brings, as desired, the axis *a* up and down, so as to make, as necessity requires, the points *m* correspond with one of the three thumbs, fig. 1. The projection of the malt by the centrifugal power against the lateral partitions of the baskets makes the radicles separate from the grain, whilst the vibration as well as the ventilation expel the same, as well as all other impurities, out of the machine through the metallic cloth.

The machine is made entirely of iron, and placed in a narrow space of brickwork or masonry supporting a plate-iron roof or cover, whilst in the lower masonry of it is a small oven for coke. The heat is applied to the machine through the tube R, fig. 2, from whence it passes through the openings *a* under the sheaves into each basket. The degree of heat is regulated by the damper or valve *q*, fig. 2, for allowing a more or less rapid desiccation, and to appropriate the same exactly to such qualities of malt as required to produce the different sorts of beer, or as required for other purposes. The machine is put in motion by the pulley *h* fixed on the shaft *g*. The conical pair of wheels *i i* transmit the motion to the principal shaft M, whilst the conical wheels *k k* transmit it again to the vertical shaft *d*, bearing the thumbs *e* and the wheels *l l* to the elevator W. The hopper V, fig. 2, suspended in the arm W, receives the motion from an eccentric *n*, fixed on the shaft *g*. All the parts of the machine that require to be greased or oiled are at the outside of the masonry. If instead of coke it is desired to heat with coal, wood, or turf, and that a chimney becomes necessary, the said chimney is passed through the chamber of the heated air, in order to give off in it the heat of the smoke and of the other products of the combustion.

A new gunpowder was tried at the late Frankfort shooting-feast, apparently with success. Its merits are, a lower price, a less weight, a more effectual action, than the general powder, to which a more important merit is added — that after thirty shots it left the barrel as clean as it was before firing. Its colour is yellowish brown; it is granular, and looks like decayed wood ground small. The inventor is a Prussian artillery captain in Spandau; and his invention is being tested by the Prussian Government.

RIFLED CAST-IRON SERVICE GUNS.

In the Mechanics' Magazine of the 8th inst. it was promised that some further remarks should be made in regard to a pamphlet then just published by Mr. Bashley Britten, upon the Armstrong Gun, as compared with Rifled Cast-iron Guns made on Mr. Britten's system. That promise it is now intended to redeem. Mr. Britten's pamphlet is addressed to the Right Hon. William Monsell, M.P., Chairman of the Select Committee of the House of Commons, on "Ordnance," but it contains matter of deep interest to all who have considered the question of the best form and materials employed in the construction of guns. Without giving our adhesion to all that is advanced by Mr. Britten in his "Letter," it may be permitted us to say that he does advance therein arguments of considerable weight in support of his own views, and that they deserve, therefore, the respect of those who value the opinions and deductions of practical men.

Mr. Britten commences by stating that, since the years 1854–5, he has been constantly urging "the great importance of proper steps being taken to determine the question whether the service cast-iron guns may not be rifled with advantage." It is not, however, his purpose, he says, to maintain "that cast-iron is the best material for the construction of large guns." What he would urge is, that "as the country is possessed of an enormous supply of guns of that material, and representing property of a vast amount, it is not wise to allow them to continue in a less efficient state when by a small expenditure it is possible to improve largely their efficiency." The writer of the "Letter" believes that it is possible to rifle any gun without materially weakening it, and to make it more efficient than a smooth bore without increasing the strain upon it. This proposition is certainly somewhat startling, and if absolutely true it is of the greatest possible importance. Let us see, therefore, by what kind of evidence Mr. Britten endeavours to sustain it. After admitting, as perforce he must admit, that "in recent experiments against armour plates it has been proved that smooth-bore guns are more efficient, at short ranges of 200 yards, than any Armstrong rifled gun that has yet been tried," he asks whether the rifled guns so used have been "the best adapted for the work?" It is clear, indeed, that upon the answer to this question the whole subject hinges. It is well known, says Mr. Britten, that "the force of impact from a projectile depends in a far greater degree upon its velocity than its weight. In the Armstrong gun, however, high degrees of initial velocity, and velocity at short ranges, are known to be sacrificed, in order to employ a long, heavy projectile which shall have a better sustained velocity for long range. Such rifled guns, therefore, are not adapted for hard hitting."

There is no room to dispute this statement, because its truth has been demonstrated over and over again. It does not, nevertheless, militate against rifling guns under any or all circumstances, and in confirmation of the fact that rifling may be advantageously employed upon service cast-iron guns especially, we have the following tabulated results of experiments made in this direction under the superintendence of Mr. Britten himself. The guns used in these experiments were:—

Two	9-pounders,	of 17cwt.	rifled	in	full-sized	bore	of	4·2in.
Three 32	"	58	"	"	"	"		6·375in.
One 32	"	56	"	"	"	"		6·41in.
Three 68	"	98	"	"	"	"		8·12in.

These were fired as follows:—

		Fired in	Projectiles of about	Rounds.
Two	9-pounders	1855	15lbs. each	54
One	32 "	1856 to 1861	50lbs. "	500
One	68 "	1860 to 1861	90lbs. "	300
Two	68 "	1860 to 1861	90lbs. "	10 ea.
Two	32 "	1860 to 1861	50lbs. "	10 ea.
One	32 "	1860 to 1862	50lbs. "	1,100

Nothing was done to strengthen these guns, and the rifling consisted of "merely a few shallow grooves planed out of the bore, about $\frac{1}{12}$in. deep, leaving broad lands between the grooves of about 1¼in. to 2in. wide, so that in firing common round shot from them the rifling was not injured."

It is on official record, indeed, that none of the guns so tried sustained any damage from the operation; and Mr. Britten certainly is only asking a reasonable question when he says, "ought not proper steps to be taken" for further demonstrating the value of his system, or for the purpose of proving its inutility?

We have thus put before our readers the broad and palpable issue upon which Mr. Britten desires to be tried, and it seems to us that the Government is bound to listen to his request.

The "Letter" proceeds with a transcription of trials made at the practice range, at Shoeburyness, with smooth bores and rifled guns, and a careful analysation of the result is given. Then follows a comparison between the Armstrong gun and the rifled service gun. This is of an instructive and highly interesting character, but space forbids our transference of it to our pages. Mr. Britten, however, confirms in the strongest possible manner the statements which we have from time to time been compelled to make in reference to the official favouritism evinced towards Sir William Armstrong. "In 1860," says the author of the pamphlet before us, "I was informed by the Secretary of the Ordnance Select Committee at Woolwich, that a recommendation should be made by that body to the War Office, to the end that a gun of strong material should be prepared for the purpose of testing my system, with the muzzle-loading shunt system proposed by Sir William Armstrong, but, for some reason that I am at a loss to account for, this recommendation was never made." Mr. Britten, therefore, is "one more unfortunate" who has had to work out his invention in the face of difficulties and restrictions.

He has met but small encouragement at the hands of those whose duty it is to examine all plans fairly, and to act impartially towards all whose practical ability and talent have led them to suggest improvements. If Mr. Britten has been able to show such good results under the most unfavourable circumstances, what might he not have effected by the friendly aid of the Government? Bitterly but most justly does he say that "the Armstrong guns represent a system which has been rendered as perfect as it is capable of being rendered, by the trial of countless changes, the command of unlimited resources, and the assistance of the combined talent of the chief military and civil engineers of the country."

We must, in conclusion, advise all who are anxious to form exact opinions upon the merits of the various systems of gun manufacture at present in force, or in embryo, to read for themselves the pamphlet of Mr. Bashley Britten. It is impossible for them to rise from its perusal without having increased materially their stock of information, and we should have felt ourselves deserving of censure had we omitted further commending it to public notice. The pamphlet is to be obtained at 39 Charing Cross, and its very small cost is one of its least recommendations.

THE NEW CUMBERLAND WAR-SHIP MODEL.

We, some time ago, recorded the fact that our townsman, Mr. John Kennedy, was preparing a model of his invention for obviating the difficulties of steering such mammoth naval architecture as the Warrior and the Great Eastern, and we have now pleasure in announcing that the model has been completed, and that it has been placed at our office for public inspection.

It is a very beautiful model, and will doubtless attract the greatest attention wherever exhibited. It has already been seen by many persons, and those interested in such matters had better avail themselves of the opportunity for seeing it at the earliest moment, as the model will shortly be removed to London.

The principal characteristics of the model are the application of the double after-ends, a device in naval architecture which was ventilated some time ago in our columns by the inventor, and which then attracted so much speculation. This principle is intended to obviate the difficulty which has proved such a defect in the steering of large ships, and, in conjunction with the entirely novel screws which Mr. Kennedy has invented, does certainly seem very likely to attain the object aimed at. The screws are of an entirely unthought-of mould hitherto, their design being to give an immense bite upon the water, and to avoid that slipping which takes place under the present form of screw, and causes such a waste of power, and consequent loss of time and speed.

To look at superficially, the form of the ship is admirable, but the connoisseur will at once single out for observation the form of the bottom, which is designed, not only to assist the speed of the vessel, but also to give her the greatest steadiness. The form of the bow will also attract attention: it is of an entirely new character, the idea being taken from the form presented by the head of a fish, and this coupled with the screws, which will act as the tail of a fish, is expected to give the vessel very extraordinary sailing qualities. The peculiar form of the bow would, if adopted on a war steamer, prove most formidable as a ram, and, in conjunction with the almost illimitable power which could be given to the screws, would constitute a vessel capable of annihilating almost any vessel she might be brought in collision with.

In applying his inventive genius to the question of motive power, we are told that Mr. Kennedy has made some surprising discoveries, and, although scarcely yet developed, his plans will, probably, when worked out, make a very close approach to a practical solution of the difficulty of realising perpetual motion.

His discovery of the means of cleaning, or rather of preventing, the fouling of ships' bottoms is also of great importance; and, certainly, if Mr. Kennedy can accomplish what he is perfectly confident he can, namely, a means for keeping the bottoms of our iron ships clean, he will have removed a great and fatal objection, inasmuch as iron vessels will then be applicable for long voyages, for which their present unfortunate tendency for fouling almost entirely unfits them. This would, indeed, be a great desideratum, and would open out a vast field for the use of iron ships.

The model has been made at Messrs. Kennedy's ship-building yard, under the immediate superintendence of Mr. John Kennedy, the inventor; it has been finished in first-class style, having been subsequently painted, and the screws gilded, &c., by Mr. Croasdale, coach-builder, of this town. Taken altogether, she will be an object of interest to anyone; but to those more particularly who are able to form opinions of her several points, she must present features of the greatest interest and speculation.

Having been brought to our office yesterday, this model of the new Cumberland war-ship has already been inspected by a large number of our townspeople, many of them gentlemen competent to express an opinion upon her form and general aptitude for the uses to which the design is meant to be applied; and while all have agreed as to the beauteous character of the model, simply as a model, they have not been few who have expressed decided opinions favourable to Mr. Kennedy's views of naval architecture, and not less strong hopes that he may ultimately be rewarded with such success as shall compensate him for the study and labour he has bestowed upon the subject, and confer honourable distinction upon his native town.—*Cumberland Pacquet.*

A method of extracting alcohol from coal-gas has been discovered at St. Quentin, France, by a young chemist named Cotelle. The report of this discovery created a sensation among the manufacturers of the north, and large sums are said to have been offered by various parties to the inventor for his patent. One company is said to have offered a very large sum for the patent, but no reason is given why the inventor did not accept so advantageous an offer. The *Progrès de l'Oise* asserts as a matter of fact that a joint-stock company was formed with wonderful rapidity, with a capital of 400,000f., to carry out the patent. The inventor announces that he can sell his alcohol at 25f. the hectolitre, while the most inferior spirit produced from other articles is selling for 75f. the hectolitre.

AN IMPROVED METHOD OF LAYING WOOD FLOORS.

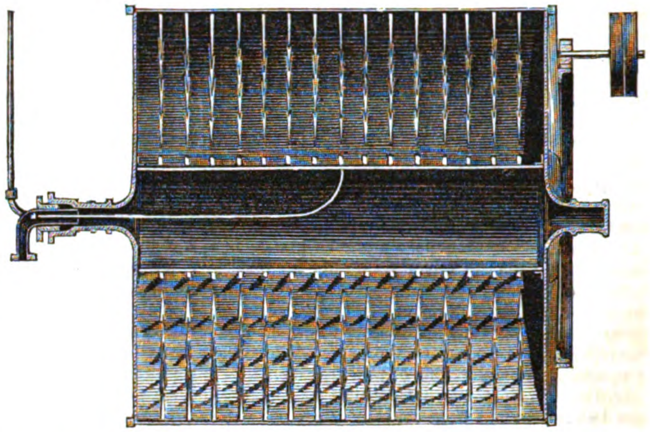
Mr. Robert Bellis, of Chester, builder, has recently patented "An improved method of laying wood floors." The invention consists in fixing, at one side of the joists on which the floor is to be laid, angle-iron, one face of which is made to project from the joist below the level thereof; and in inserting into the underside of each deal or board composing the floor, T-headed screws, one arm of which, on the boards being laid, becomes engaged under the projecting flange of the angle-iron. The ends of the boards are wedged up against the side of the room or building being floored.

Fig. 1 of the accompanying drawings is a section, and fig. 2 is a plan of the underside of so much of a floor as will be necessary to illustrate the manner in which the invention is carried into effect. *a a a* are the joists, to which the angle-irons *b b b* are secured by screws, as shown in fig. 1, or otherwise; *c c c* are the T-headed screws, screwed into the underside of the boards, the heads of which become engaged under the projecting flange of the angle-iron as shown; *d d* are the wedges inserted between the ends of the boards and the side or end of the room. *e* is a skirting for hiding the wedges. Though T-headed screws are recommended as being most convenient, yet screws with one shoulder instead of two may be employed.

The above mode of laying wood floors will be of advantage to architects and builders, inasmuch as by adopting this method the joints, through the shrinkage of the boards, can be easily closed. They can be taken up for the purpose of laying in gas, water-pipes, or bell-wires, at any time; and as nails are not required in the fastening, the floors will be equal to a dowelled one, and much cheaper.

The boards need not be laid until the ceilings and plasterings are finished, as the fastenings are T-screws and angle-iron, screwed to the joists.

SAMPSON'S APPARATUS FOR DRYING WOOL.



SAMPSON'S APPARATUS FOR DRYING WOOL.

This invention, by Mr. E. B. Sampson, of Ham Mills, Stroud, has for its object improvements in apparatus for drying wool and other fibres and substances. For these purposes a rotating vessel or chamber is employed, by preference of a cylindrical form as represented, though the shape may be varied. The rotating vessel or chamber has two ends or covers, through the centres of which the axes of an internal heating chamber or vessel pass. The ends or covers above mentioned are formed with holes or openings to allow steam or vapour from the wool, or other fibres or substances (such as feathers and seeds), within the vessel or chamber to pass away freely, and it is also preferred that holes or passages should be formed for the same purpose in the revolving chamber or vessel.

It is desirable, that after provision has been made for the free passage away of steam or vapour, the rotating vessel should be as close as may be to retain the heat therein.

In order to introduce and remove the wool or other substances into and from the revolving chamber or vessel, part of the periphery is made to open. Within the revolving vessel or chamber there are rows of projecting teeth radiating towards the centre, or other provision is made in order that the wool or other substances may not slip towards the lowest part of the vessel or chamber as it revolves on its horizontal axis. The internal central vessel is preferred to be cylindrical and heated with steam, though this form is not essential, and the mode of applying heat thereto may be varied; it is also desirable that this internal vessel should revolve so as to insure that the wool or other substance when it falls on to the heating vessel shall slide therefrom on to the lower part of the rotating vessel or chamber. If desired, the rotating vessel or chamber may be made of such form and construction as to admit of its being heated, and thus by its heat also contribute to the drying of the wool or other substance. By these arrangements the wool or other fibre within the rotating vessel or chamber will be continually raised up to the highest position, and then allowed to descend to the lowest position through the heated atmosphere of the chamber and in contact with the heated surface.

On the interior of the revolving chamber or vessel are parallel bars with teeth projecting inwards, or such teeth may be otherwise fixed within the cylinder. The sides and covers of the cylinder or chamber have openings through them in order that the vapours evolved from the wool or other fibrous substance which is being dried may get away freely from the revolving cylinder. The wool or other fibrous substance to be dried is introduced into the cylinder or chamber and discharged therefrom through the doorway; steam, or it might be heated air or other fluid, is supplied to the interior vessel by the pipe, the end of which is received into a suitable stuffing-box. The steam and condensed water or hot air or other fluid which is used passes away from the same, or from the other end of the vessel, by another pipe, the end of which enters a suitable stuffing box, and the speed of the flow of the heating fluid may be regulated by the cocks on the pipes. By these means the surface of the interior vessel or cylinder is kept constantly heated. The outer revolving vessel or chamber may, if desired, be made double, or of such form as to admit of steam or other heated fluid being used to heat the same, so as to aid in drying the wool or other fibrous substance placed therein. It is preferred that a slow rotating motion should be given to the inner vessel, in order to insure the wool or fibrous substance dropping or sliding therefrom, or the outer cylinder may carry a scraper or instrument to remove any fibres which may rest on the cylinder. Motion is preferred to be given to the outer cylinder or chamber by means of a cogged wheel fixed on the end of the cylinder.

QUARTZ CRUSHING AND AMALGAMATING GOLD.

The Esmeralda California *Star* gives the following description of operating gold quartz at the Pioneer Mills in Esmeralda:—This mill is run by steam power, using a rotary battery and running eight stamps; its capacity with double screens on is to crush four and a half tons per day; without screens, it can crush from five to six. The rock while being crushed is fed with hot water, which causes the amalgamation to work more readily. The pumice passes off through a spout into what are called "Howland's amalgamating pans;" thence into an arastra, and from thence into a precipitating or amalgamating vat, and is then conducted into what are called "Varney pans," which act as mullers, and grind the pumice down to a perfect pulp, when the final amalgamation is completed: this pulp is now greatly reduced by water, and is carried off by a spout and flows over blankets; these latter catch and retain the sulphurets and the finer particles of metal which the amalgamators fail to gather; the blankets are then washed by hand, and the sediment is reduced by what is termed the "Hatch process," which is extensively used at Virginia and Gold Hill. This mill is now crushing rock from the "Wide West" ledge, the owners having a contract to crush 1,000 tons.

THE INTERNATIONAL EXHIBITION.

Class I. — Steel.

(From *The Times.*)

We now take up the subject of steel. Such a complete and, in some respects, marvellous series of specimens in illustration of steel has never been seen before. The opportunity of studying this collection will, it is hoped, be eagerly embraced by all who are interested or concerned in this important branch of manufacture. With a view to the instruction of the general reader, we propose, in the first place, to describe as concisely as possible the properties of steel; and, in the second place, to explain the principles of the various processes by which it is made. We have previously stated that steel is essentially iron containing carbon within certain limits, which cannot be exactly assigned, but which may be taken approximately as half and one-and-a-half per cent. The characteristic property of steel is that of being susceptible of various degrees of hardness by the common and well-known process of tempering. Thus, if a piece of steel be heated, say to low redness, and then rapidly cooled by immersion in water, it is rendered extremely hard and brittle; but if this hardened steel be strongly reheated and afterwards left to cool slowly, its original softness will be restored. Now, in the process of reheating, which we will suppose to be very gently and gradually effected, it will be observed that the surface of the metal will acquire a succession of well-defined tints, beginning with pale straw and ending with deep blue, the former corresponding to the *lowest* and the latter to the *highest* temperature during the reheating process. If pieces of the same kind of steel be heated so as to acquire respectively this succession of tints, and then instantly plunged into water, or otherwise rapidly cooled, they will be found to possess different degrees of hardness corresponding to the different tints. It is in this manner that steel is actually tempered. The philosophy of the subject is extremely interesting, but in this place cannot be discussed. When we reflect that we are able by such remarkably simple means so to modify the properties of the *same* piece of steel as to transmute it into virtually distinct metals, as far as hardness and certain other properties are concerned, we cannot fail to admire this example of the simplicity and ingenuity of nature. Steel is much more fusible than wrought iron, and may be melted in ordinary furnaces, when it is termed cast steel. Steel may be welded to steel, or to wrought iron, under suitable conditions as to quality of metal and temperature.

The fracture of steel is peculiar, and varies with the proportion of carbon and the treatment which the metal may have previously received. It is more or less finely granular, and when produced in the brittle state of the metal may be conchoidal or shell-like, such as is presented by the broken surface of a lump of glass.

We pass on to the consideration of the principles of the various processes employed in the manufacture of steel—a knowledge of which is essential to the right understanding of many of the articles exhibited. Steel was sometimes accidentally obtained in the primitive method of extracting iron in the malleable state direct from the ore; but it would be impracticable by this method to procure steel of any degree of equality. The processes now in operation are founded on two opposite principles — namely, putting carbon into wrought iron, and taking carbon out of pig iron, which, it will be borne in mind, contains more carbon than steel.

Carbon is put into iron in the following ways:— 1. By melting wrought iron with carbon. This is the ancient Hindoo method of preparing the famous "wootz." The principle has recently been revived in this country in making the so-called homogeneous metal. 2. By cementation—*i. e.* exposing flat bars of iron imbedded in charcoal to about the temperature of melted copper during many days. Carbon thus travels into the very centre of the bars; but how this takes place has not yet been clearly explained. This process of preparing steel is an English one; the furnaces are termed "converting furnaces," and the bars of steel produced are called "blister-steel," from their being studded here and there with blister-like protuberances. 3. By exposing rich iron ore to the action of reducing gases, whereby the metal is obtained in a metallic and more or less spongy state, and then melting this metallic sponge, previously impregnated with carbonaceous matters. Cast steel is thus produced, and the process is known as Chenot's. A well-known French metallurgist had at one time an exalted notion of the value of this process, and once declared in our presence, now many years ago, that it would supersede every other, and that by its means steel might be made and sold at 40 per cent. less than Sheffield steel. There was a great hubbub about Chenot's process at the jury of the French Exhibition in 1855, when an attempt was made to procure for it "la grande médaille d'or." Twice was this refused by the jury; but after the departure of the foreign jurors, the "grande médaille" was subsequently granted by the "Conseil des Présidents."

Carbon is taken out of iron in the following ways:—1. By exposing pig iron to the action of a blast of atmospheric air at a high temperature in a charcoal hearth. "Natural steel" is thus formed. 2. By the process of puddling, conducted so as to leave sufficient carbon in the iron to produce steel. Wrought iron is obtained from pig iron by puddling—that is, heating the metal in a reverberatory furnace with free access of air, and working it about until the carbon is burnt out, or nearly so. Now, if steel be only iron containing more carbon than wrought iron and less than cast iron, it is obvious that in puddling the intermediate state of steel must be passed through. But it is only recently that steel has been made by puddling, yet "puddled steel" is now very extensively manufactured. 3. By blowing air through melted pig iron. This is the process of Bessemer, which has excited so much attention of late, and deservedly so. The carbon and silicon are readily burnt out, and a considerable quantity of iron is also oxidised, as is the case in every process in which pig iron is converted into wrought iron. What could, at first sight, appear easier than blowing air through melted iron? An idea is one thing and its realisation in practice is another. Bessemer has had to contend with many practical difficulties, and is entitled to great credit for the ingenuity and perseverance which he has displayed in surmounting them. This remarkable process is probably destined to effect greater changes in the manufacture of iron and steel than many of our ironmasters suspect or would be willing to believe. As a spectacle, there is nothing so startling and, in our view, so magnificent in the whole range of metallurgy. The melted pig iron is allowed to flow from an adjoining cupola furnace into the "converting vessel," which is a circular vessel of iron coated internally with a refractory lining of silica. Several jets of air are then blown in at the bottom and bubble up through the metal. For a time all goes on quietly, but the temperature gradually increases, and at length a volcanic eruption in miniature suddenly occurs, melted scoriæ being projected on all sides with great violence, and which, if allowed to escape, would inflict serious mischief on any unhappy bystanders. But soon all is again tranquil, and the chamber contains malleable iron in a state of perfect liquidity. This may be tapped out into moulds, and, with special precautions, drawn out into bars, &c.; but it is apt to be cellular and unsound,—defects which Mr. Bessemer has had great trouble in overcoming, if even now he has thoroughly succeeded. Steel is made by introducing into the melted iron in the converting vessel a given quantity of spiegeleisen, containing a known percentage of carbon; and so steel may be produced with any required proportion of carbon. The spiegeleisen dissolves in the iron like sugar in water, rendering the metal more fusible and very liquid. Unfortunately, in the Bessemer process, when pig iron containing phosphorus is operated on, this injurious element is not separated in a sensible degree, as is the case in the process of puddling; so that only those varieties of pig iron which are free from phosphorus, such as hæmatite pigs, &c., can be advantageously used. The Bessemer process is now carried on by two firms at Sheffield—his own and the Atlas works, and, if we mistake not, also in the North by the Weardale Company; and that it should have succeeded in establishing itself at such a stronghold of prejudice as Sheffield augurs well for its final success. The Sheffield people still maintain that good steel for cutlery cannot be obtained by Bessemer's process. We have made particular enquiry on this point, and have received most positive statements on the subject from some steel-makers of vast experience, who, we are sure, are not under the influence of prejudice. But all men are liable to mistakes, and time will soon show whether these gentlemen are correct or not in their judgement. It seems pre-eminently adapted for India, where suitable pig iron may be made with advantage, and where, owing to the heat of the climate, it is especially desirable to avoid the laborious work of puddling. Indeed, it is already in operation at the Porto Novo Works, Madras. Mr. Bessemer introduced his process in 1855. It was received with approbation by some ironmasters and with contempt by others. We have reason to know that certain firms wished to possess themselves of it, in order to hold it *in terrorem* over their puddlers, who have not always shown themselves either the most tractable or the most reasonable men in the world. May Mr. Bessemer live to acquire that fortune which should be the just reward of his invention; and when he has got it, may he, unlike many other successful inventors, have the wisdom to keep it!

In addition to the processes last described, it is necessary to mention others which are also represented in the Exhibition. There is the method of Uchatius, which consists in melting together granulated pig iron and oxide of iron, when the carbon of the former is more or less burnt out at the expense of the oxygen of the latter, with a corresponding reduction of iron. The proportion should be so regulated that sufficient carbon may be left to form steel. In another and old process scrap wrought iron is melted in admixture with pig iron. The product retains the whole of the carbon, and the relative amounts of the ingredients used must be such as to produce steel. It is requisite for this purpose that the pig iron should be of good quality, and that of British make, except the charcoal pig, is too impure. But Messrs. Price and Nicholson maintain that our refined iron is sufficiently pure to admit of its being employed with advantage in this method of making steel. It should be borne in mind that all steel, by whatever process it may have been produced, is termed *cast steel* after having been melted. The variations in quality of the different kinds of steel in commerce are innumerable, and in many cases the reasons for such variation are quite unknown. They are undoubtedly chemical, but have hitherto baffled the efforts of chemists to detect them. Much attention has, however, of late been directed to this most interesting subject, and there is now some hope that we shall not much longer remain in our present state of ignorance concerning it.

We shall consider the varieties of steel in the Exhibition in the order in which we have briefly described the principles of the various methods employed in its production.

Specimens of wootz in the usual well-known little conical ingots will be found in the Indian collection (Class I.); but there is nothing peculiar about them to demand more than a passing notice. Not so with regard to the so-called homogeneous metal, which has excited much attention of late. It is extremely malleable and tough, and may be placed midway between wrought iron and ordinary steel; it may be regarded as steel containing a low percentage of carbon. This is the metal of which Mr. Whitworth has formed so high an opinion, and there is no doubt that it is valuable for many purposes; but it is difficult to obtain it uniform in quality. Examples of it will be found in Class 32, No. 6,456, exhibited by Shortridge, Howell, & Co. Pieces of tubing formed of this metal are shown flattened down

vertically, which might readily be mistaken for caoutchouc. We have not seen this metal made, but we are informed that it is produced by melting pieces of Swedish iron and carbonaceous matter. In the specification of a patent, No. 2,369, A.D. 1856, it is stated that scale, which falls off from steel or iron during the process of hammering or rolling, is employed in addition to the ingredients in common use for cast steel. Now, if anyone will take the trouble to refer to Mushet's *Papers on Iron and Steel* (1840, p. 525), he will find a description of a metal which exactly applies to the so-called homogeneous metal. The process of manufacture appears to be essentially the same, and was patented by Mushet in 1800 (No. 2,447), who is reported to have sold the patent to a house in Sheffield for the sum of 3,000*l*. At the present time the subject is one of no small importance to our practical workers in iron; and, as many of them may not be aware that homogeneous metal was manufactured so long ago, we subjoin an extract from Mushet's work:—

When iron is presented in fusion to 1-140th or 1-150th part of its weight of charcoal, the resulting product occupies a kind of middle state betwixt malleable iron and steel. It then welds with facility, and, provided the precaution formerly mentioned is attended to, may be joined either to iron or steel at a very high welding heat. Thus combined with carbon it is still susceptible of hardening a little, but without any great alteration in the fracture. It possesses an uncommon degree of strength and tenacity, [and is] capable of an exquisite degree of polish, arising from its complete solidity and the purity of fracture conveyed to it by fusion.

If that be not "homogeneous metal" we know not what is. In these days, when patent monopolies beset us on every side, it is desirable that the utmost publicity should be given to facts such as we have just recorded. Why, the zincing of iron, or, as it is grandiloquently called, "galvanising," which has been the subject of more than one recent patent, and, of course, of much litigation, was practised in France about the year 1740, precisely as it is done at this day; and a description of the process was given by Bishop Watson in his well-known and widely-circulated *Chemical Essays*, published towards the end of the last century. And many other instances might be mentioned of old inventions having been monopolised by modern patentees.

Examples of steel produced by the cementation process will be found in the British and several of the foreign departments; but there is nothing requiring particular comment under this head. Until recently all the steel at Sheffield was made by this process, and Swedish iron has been largely consumed for the purpose. Different varieties of iron are known to yield different qualities of steel, but the knowledge respecting these differences is generally regarded as a trade secret. The prices of Swedish iron vary considerably. Thus, No. 72 in the catalogue sells at 32*l*. per ton; No. 50, at 21*l*. per ton; No. 64, at 16*l*. per ton; No. 49, at from 12*l*. to 14*l*. per ton. No. 21 bar iron is well adapted for gun barrels, and No. 64 for card wire. The Swedish ironmasters affect much secrecy, especially with each other, regarding the prices at which they dispose of their iron. We regret that Sheffield is very inadequately represented in the present Exhibition. We miss the names of some of the chief firms, such as those of Sanderson, Jessop, &c. The reason assigned for this is, that sufficient space could not be obtained to enable them to do justice to themselves, and they declined to exhibit at all. There were 170 applicants for space, but half of them withdrew on finding that suitable accommodation could not be granted. This is a serious matter for Sheffield. She no longer maintains her boasted preeminence, even in common articles of cutlery—such as table-knives, in which she is beaten hollow by the French, and this, too, it is said, with steel of her own manufacture imported into France. In surgical instruments she is also signally defeated by the same invading foe. Before the Exhibition she scouted the idea of a rival; but her eyes are now opened, and we have the best authority for stating that she feels her humiliation, and is resolved to amend her ways. In these days of fierce and incessant competition, a manufacturer must not commit the folly of relying upon a reputation buried in the grave of his ancestors. There are energetic and enterprising men in Sheffield, of whom not the least is the present Mayor, whose magnificent rolled armour-plates we have previously pointed out as among the most remarkable objects in the present Exhibition. Nor should we omit to mention as worthy of special praise the firm of Naylor, Vickers, & Co. It is due to the Mayor to record the fact that he has acted in the most liberal manner to foreign jurors and others in granting them free access to his works, where they have witnessed the Bessemer process on a great scale. Those gentlemen have expressed themselves in terms of warm admiration at their reception, and have returned home with recollections of the Mayor of Sheffield which will not be readily effaced.

Chenot's process has been tried in several localities, and has not, we hear, been found successful in a pecuniary point of view, notwithstanding the brilliant auspices under which it was ushered into the world. There was a great display of the *éponges métalliques* in the Exhibition of 1851; and in the present Exhibition various products are exhibited by the Brothers Chenot, in the French Department, No. 14.

Natural steel continues to be produced on the Continent. The Imperial Works, in the Austrian Department, No. 66, which are the most renowned for the production of Styrian steel, exhibit natural steel and cast steel made from it. They manufacture neither puddled nor cement steel. Specimens of natural steel will be found in the Italian Department, Nos. 52–71. It is derived from spathose ores, and is produced by the method known as the Bergamasque.

The manufacture of puddled steel is now largely developed on the Continent; but in Great Britain it has not yet made much progress. Mr. Clay, of the Mersey Works, was the first to introduce it successfully into this country. We have seen it made within the last three years in South Wales. Considerable skill is required in the management of the process, and under any circumstances it is difficult, not to say impossible, to produce steel of uniform quality, even in the same operation. In the Austrian collection are numerous examples of puddled steel, among which may be mentioned the following:—No. 37, Count Meran's Ironworks, Krems, Styria, interesting from having been produced with raw lignite as fuel, which contained 25 per cent. of water and much ash; No. 35, Francis Mayr's works, Leoben, Styria. The examples of this kind of steel are so numerous in some of the foreign departments, that to enumerate them is quite out of the question. In Prussia the manufacture of puddled steel is largely carried on, and examples of the metal, especially in the form of rail sections, are shown in the Zollverein collection. We may notice the puddled steel of the Limburg Company, Westphalia (No. 779), as puddled steel was first made in Germany at these works. The steel is reported to be of excellent quality. In the Swedish Department, Zethelius (No. 69) exhibits puddled steel, produced with wood as the fuel.

We now arrive at the consideration of one of the most extraordinary and most important collections in the Exhibition, the like of which has never previously been witnessed: we allude to the truly magnificent display of Krupp's cast steel. The special points of interest are the wonderful soundness and the enormous size of the castings; and in these respects he is so far in advance of all other producers of cast steel that it will be extremely difficult to approach, much more to overtake, him. Krupp affects considerable mystery in his processes. He rejoices in astonishing the world by the magnitude of his operations; and, like many others, who have far less reason for self-gratulation, he is not inaccessible to the charms of popular applause. He has printed a handsome series of plates of various objects of his manufacture, which is prefaced by four photographic views of his works in Essen. They are evidently of large extent, and are reported to occupy, one way or other, 180 acres of ground. It is stated that he employs puddled steel, which is broken up, assorted, and re-melted in crucibles. This variety of steel does not appear to be adapted for cutlery. He consumes all the spiegeleisen produced by Müsener & Co. It is affirmed that there is a great consumption of plumbago and leather parings at the Essen Works. Each crucible is said to contain 70lbs. of steel, and the furnaces in which they are heated vary much in dimensions, the smallest holding two and the larger twenty-four crucibles. When a large casting is required, the organisation has been carried to such a remarkable degree of perfection, that at a given signal all the crucibles needed are ready to be taken out of the furnace at the same time. Their contents are poured with the utmost rapidity into a large reservoir, and from this the metal is cast. By this means, as in bronze-founding on the large scale, homogeneity is attained. The apparatus for working the steel is the most gigantic yet constructed. There is a steam-hammer weighing 50 tons. The anvil face weighs 185 tons, and cupola furnaces were built expressly to melt this large quantity of metal. The largest casting in the world is the great bell at Moscow, reported to weigh 192 tons; but it cracked in cooling, and was never removed from its birth-place. Krupp's anvil rests on eight blocks of cast iron, weighing from 125 to 135 tons each, and making a total weight of 1,250 tons of cast iron! This solid structure of iron is supported on a wooden foundation 40ft. square. The mould for casting steel solid should be constructed so as to avoid the presence of all angles, of which the inevitable effect would be to cause a lodgement of the air, and consequent unsoundness, due to bubbles. Vent-holes will not suffice to remedy this evil, as they become so soon stopped up by the rapid solidification of the steel that the air has not time to escape. The largest casting exhibited by Krupp in 1851 weighed 2¼ tons, and the largest in the present Exhibition weighs 21 tons. It is in the form of a solid cylinder, about 9ft. high and 3ft. 8in. in diameter. It has been broken across to show fracture. We have inspected the fractured surface over and over again, even under a good lens, and we have failed to detect a single flaw. The largest casting Krupp ever made weighed 25 tons. Now, when we reflect that this enormous mass of metal is melted in comparatively small crucibles, we get an idea of the perfect organisation requisite to have every crucible ready, and the pouring effected at almost the same moment of time; and it is in this organisation that we are disposed to think one great merit of Krupp consists. A large rectangular ingot, weighing 15 tons, is exhibited; it has been broken across in eight places to show uniformity of quality and structure; it was cast cylindrical, and reduced afterwards under the hammer to the rectangular shape. Krupp exhibits shafts, rolls, railway tires and wheels, locomotive axles, and guns. There is a good catalogue in German, illustrated with a photograph of the various objects in the collection, and there is also a price list of the cast-steel guns. A finished gun of eight inches calibre, turned, bored, and rifled, without breech-closing apparatus, is advertised at 975*l*. Among the plates in the large series previously referred to, we notice drawings of locomotive axles supplied to some of our largest railway companies, and crank axles of marine engines supplied to some of our most celebrated marine engine-makers. We congratulate Krupp on the preeminent position which he occupies in the world as the producer of the largest and soundest castings in steel, though not on the site which he occupies in the Exhibition. Whose fault is this? But tallow, toys, and sweetmeats evidently stand high in the estimation of Her Majesty's Commissioners. In the vicinity of Krupp's Works is the smaller establishment at Bochum. We are informed that the processes here adopted are the same in all respects as at Krupp's, and that access to the Works is liberally granted by the proprietors. The large steel bell, not far from Krupp's collection, was cast at the Bochum Works. Steel cannot be compared with bell-metal for quality of sound, but is a cheaper material.

Bessemer makes an admirable display, and has certainly no reason to complain either of want of

space or of obscurity of position—an exceptional case. He exhibits both iron and steel produced by his process, and specimens illustrative of the quality of the metal, as shown by hammering, punching, bending, twisting, stamping, rolling, drawing into tube and fine wire, turning, polishing, &c. A rail is shown, 84lb. to the yard, which may be supplied at 13*l*. per ton. The tensile strength of the Bessemer steel is great, and the metal is now obtained of very uniform quality. Out of 28 pieces taken at random in one establishment, the extreme of difference in tensile strength was about 5lb. or so. We have already said so much about the Bessemer process, that nothing need be added. It is certainly destined to play an important part in the world, and the inventor has reason to rejoice at the success which he has achieved, though he never received a professional education according to the orthodox notions of existing ironmasters. In the French Department, Jackson, Son, & Co. (No. 4) exhibit steel objects made by the Bessemer process. The Swedes have sent both iron and steel made by this process. The large tire is of Bessemer iron. Bessemer steel will be found under the following numbers:—No. 31, Kloster Works, Dalecarlia. At these works are the largest charcoal blast furnaces in Sweden, each producing about 100 tons of pig iron weekly. No. 73, Carlsdal Works, Nericia. No. 75, F. Göransson, Gefle, who was the first to introduce the process into Sweden. Many difficulties had to be encountered, and great expense incurred. Göransson is reported to have effected several improvements. No. 56, Siljansforss Ironworks, Dalecarlia. The process has not yet made its way into Austria. The Prussians have tried it, but failed, and assign as the reason the unsuitable quality of the pig iron employed.

The process of Uchatius excited some attention a few years ago, especially in London. It has been tried but not adopted in this country, for two reasons—first, the difficulty of obtaining uniform results; and, secondly, the high cost. Samples, however, of Uchatius steel are exhibited in the Swedish Department, No. 65, Ulff, Dalecarlia. This steel, strange to state, finds a ready sale at prices ranging from 50*l*. to 60*l*. per ton, which are higher than can be obtained for Bessemer steel in Sweden. It is said to be specially good for sword-blades. It is made by melting Bispberg iron ore, mixed with charcoal, in Belgian crucibles. This ore is remarkable for its purity.

Cast steel made by melting together wrought iron and charcoal pig iron is shown in the Swedish Department, under No. 50, Rettig, Gefle. Cast steel, made by melting together wrought iron and *refined* pig iron, is exhibited by Dr. Price, No. 286, in the British Department, Class I. It is maintained that coke pig iron may be sufficiently freed from silicon and certain other impurities by the refining process as to admit of being employed with advantage in the manufacture of this kind of steel. There may be more in this method than is now supposed.

In the Austrian collection are specimens of the so-called wolfram steel, made by melting together cast steel and the mineral wolfram. The quality of the metal, it was believed, would be much improved by this addition. It breaks with a very fine grain, and is hard and tough. We have learnt on excellent authority that this alloy has not been found successful. We know that a year or two ago some Vienna wolfram steel was submitted to trial by one of the first Sheffield steel makers—a man quite free from the charge of prejudice—and he reported unfavourably concerning it. At present we hear much of the value of titanium and other elements in steel. We have examined this subject with particular care, and have failed to discover satisfactory evidence of the good effects attributed to the presence of such foreign matters.

In the Austrian Department are drawings of Mayr's furnaces for casting steel on Siemens's principle; and we particularly recommend them to the attention of our steel makers. The drawings will explain themselves to those persons who understand Siemens's "regenerative furnaces," of which excellent models are exhibited in the Machinery Annexe. A description without drawings would be of no avail. Lignite is the fuel used, of which three parts by weight are required to melt one of cast steel. In six days between five and six tons are melted in one of these furnaces. Siemens's furnace is evidently founded on philosophical principles, and is, we believe, destined to play an important part in various metallurgical and other operations.

We have now completed our review of the smelting and manufacture of iron throughout the world, so far as they are represented in the present International Exhibition. We have earnestly striven to mete out justice with an impartial hand, neither fearing to censure nor being reluctant to praise. Great Britain has come out nobly, notwithstanding the absence of many of our leading ironmasters. We will not inquire further into the reasons of this indifference. Those who have exhibited are entitled to the gratitude of those who have not. Sweden amply sustains her long-established reputation. Prussia and Nassau have much distinguished themselves. Austria deserves great praise, especially for the liberality and freedom with which she has communicated information. Belgium might have done better. Russia has done well. Italy gives proof of vigorous rejuvenescence. France, remarkable to say, has not even attempted to do justice to herself. Spain presents a melancholy spectacle, thanks to somebody or other. Canada has covered herself with honour. The United States are nowhere. Australia has revealed all her treasures, and excited the envy of the world.

BANK-NOTE SPLITTING.

Mr. Thomas Millard, a native of Bath, now one of the Queen's book-binders, under the librarian at Windsor Castle, has discovered a method of splitting bank notes or any other sheets of paper. By the courtesy of Mr. Gregory, of Bath Street, with whom Millard served his time as an apprentice, specimens of the young man's ingenuity, consisting of a 5*l*. Bank of England note, a sheet of the *Times*, of the *Illustrated London News*, of the *Bath Journal*, and of the *Daily Telegraph*, each of which has been split cleanly and cleverly into two parts, without any rent or tear, have been exhibited to many of our fellow-citizens during the past week. There can be no mistake about the matter, as we have now before us a copy of a leaf of our own *Journal* completely split in two. The separate parts could well be printed on at the back, but the separation of the flimsy paper of the *Telegraph* seems equally complete. The engravings in the illustrated journal are brought out more clearly by the process, and when mounted on cardboard present a strikingly improved appearance. The discovery is applied by Mr. Millard to practical use in print-mounting, and in repairing torn leaves of books, which he can so skillfully manage that the junction of the new and old paper can with difficulty be distinguished. The mounting of old prints upon paper is also so complete, that the specimens we have seen seem impressed upon the original paper. Unscrupulous people would certainly turn this plan of bank-note splitting to profitable account, if they could find it out, inasmuch as the halves could be made as stiff as the whole, the blank parts could be printed in imitation of the original, and the water-mark would of course be perfect. A cotemporary says that "Mr. Millard has devised a method of manufacturing paper that cannot be split, and bankers will probably soon be compelled to make use of his invention;" but this we understand is a mistake. Mr. Millard, to prevent the difficulty which might arise to the Bank of England for having their water-mark left on blank pieces of paper, upon which might be printed *facsimiles* of their notes, suggests a plan for the prevention of the fraud. We are glad to hear that Her Majesty, in consideration of the talent displayed by Mr. Millard in this discovery, has already been pleased to order that he should have an increased salary. We hope his discovery may further lead to his pecuniary advantage.—*Keene's Bath Journal.*

TO CORRESPONDENTS.

Received—W. S., M. A., W. A., J. Le C., J. F., W. R., J. H. T., Col. R., E. L., E. R., Capt. N., W. H. P., R. D.

Errata.—In our article of last week on the "Coinage of 1861," *decimal points*, in lieu of *commas*, should have separated the last three figures of the total weights of gold and silver coined, and the word "*punctuation*" should have been "*peculation*."

Correspondence.

[*We do not hold ourselves responsible for the statements of our Correspondents.*]

THE STRAIGHT LINE *VERSUS* THE WAVE LINE FOR VESSELS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Sir,—Mr. Cheverton must be aware that *five years* ago I used precisely the same arguments and illustrations as I have now done. In vol. 67 of the M. M. several references are made to the crank motion; and the very curve itself cannot be formed on any other basis. Mr. Cheverton at that time strenuously attempted to oppose my views with ill-defined logic—without success—with *different arguments to those he now uses* (if, indeed, any tangible argument can ever be found in his letters); and his improper personal remarks then drew forth some severe rebukes, editorial and otherwise. His remarks, therefore, as to my being in a dilemma, and having perplexed and tangled ideas, are contemptible, from the spirit in which they are conceived.

I have hitherto replied to *some* of his personalities; it would be childish to do so to those contained in his last letter.

Mr. C.'s flourish about the theorem of the composition and resolution of forces, and the parabolic path of a projectile *in vacuo*, is amusing.

Having fully refuted all that Mr. C. has *asserted* (not proved) about the straight line, I shall remain silent upon the subject until he is able to bring forward something better than he has hitherto done in support of his straight line. Perhaps I may request, on behalf of myself and your other readers, that he will condense his letters?—I am, Sir,

Your obedient servant,
T. Moy.

1 Clifford's Inn, Aug. 18, 1862.

[We cannot devote any more space to this controversy between Mr. Cheverton and Mr. Moy. Personalities in discussion, by whomsoever introduced, are evidences of weakness.]—Ed. M. M.

Sir,—Messrs. Moy and Cheverton appear hitherto to have had this subject all to themselves, and, for this reason, I hope they will pardon me if I ask for a small space to have my "say" on the subject.

Mr. Cheverton, though well known to possess great practical knowledge of most matters, does not seem to me to have much on this subject, whilst I must compliment Mr. Moy, who, I am informed, has great (though self-taught) knowledge of the subject, on the way in which he has illustrated his remarks.

It seems to me that Mr. Cheverton turns his attention more to the water after it has been disturbed by the passage of the vessel, rather than to the question at issue, viz. how to move the water so that the least power shall be expended in moving it. There can be no doubt that it is very difficult to describe the motions of the water when disturbed by the passage of a ship, but I am perfectly satisfied that Mr. Cheverton's straight-line bow is not the form of least resistance, or one calculated to move the water with the least possible amount of disturbance.

If Mr. Cheverton will take the trouble to stand near one of the piers of the New Westminster Bridge, the cutwaters of which have straight lines, and a tolerably sharp entrance, he will, I think, see that the action of the water shows that even at the low speed of, say, three miles an hour for the velocity of the current, the straight line can in no way be considered capable of performing the duty required of the form of "least resistance." I believe it is generally admitted that nature works on unerring principles; and if Mr. Cheverton admits this, he will soon see that the "wave" or hollow line must give, if properly suited to the circumstances, the most certain results. A year or so since, whilst the river Thames was filled with floating ice and congealed snow, an engineer well known to me, and one who, like Mr. Cheverton, wanted to see everything "straight," was crossing one of the bridges which had the waterway considerably obstructed by piles, when he was

struck by the form in which the ice had accumulated against the piles obstructing the current. The ice, &c., had taken the form of a cutwater to the piling, and the lines resisting the current were hollow or "wave" lines, and there was no disturbance of the water or throwing off of the ice (as was the case in the piers of the bridges with straight or convex lines), thus showing that the current passed with the least hindrance, and the pieces of floating ice continued in contact with this "glacial wave-line cutwater," all the time it was passing.

My friend spent some time in watching this, when it at once occurred to him, that as nature had used a "hollow" or wave line for the purpose of obtaining as little resistance as possible, the hollow or "wave" line must be preferable for the purpose. Next day he called on me and related the occurrence, and agreed with me in considering that if it had been examined it would have shown the proper proportions of length as for a bow, at a speed of three to four miles an hour. I may add, that he has since studied the wave-line theory as laid down and explained by Mr. Scott Russell, and is now one of its staunchest supporters.

I would ask Mr. Cheverton how it is that the ploughs we see are all made with beautiful wave or hollow lines? Surely, if the simple and easily-made straight lines had been found best, they would have been adopted, as here, again, it is a question of least resistance. I have sailed in ships built with straight lines, with convex lines, with hollow lines, and true wave-line ships; and I must say that in none of them do I find so little disturbance of the water, or the ship so well and equally waterborne whilst in motion, as in the wave-line ship. It is a fallacy, and a strong proof of the ignorance of persons of the principles of the wave-line theory, who class every ship, whose bow has a hollow line, as a wave-line ship. I would ask Mr. Cheverton to read carefully and attentively Mr. Scott Russell's experiments and remarks on the wave line, and also Griffith's "Naval Architecture," a work written by an American ship-builder, and I think a little consideration will show him that the straight line cannot do what is required, and a visit to any of the docks in London will show him the strong tendency in all modern ships to employ a hollow line, instead of the straight or convex one.

Your obedient servant,

Chas. F. T. Young, C.E.

7 Duke St., Adelphi, W.C. Aug. 16, 1862.

WASTE GUNPOWDER.

Sir,—Witnessing in your valuable journal your untiring energy to give publicity to all matters relating to warfare, will you kindly allow me space in its columns for a few remarks on a matter which appears to me to be a very serious oversight in the present construction of ordnance and all firearms? What I am now about to point out is, no doubt, a subject which has hitherto been considered too trifling to be worth any deep consideration or proof by experiments; but I am inclined to think that others will, in the end, arrive at similar conclusions to my own. I am led to make these observations from a circumstance which occurred some little time since, while I was on board a steam-ship which carried a pivot-gun, on which being fired, I immediately approached it, and discovered, to my astonishment, the deck strewed with a quantity of unburnt powder, which proved to be a portion of the charge with which the gun was loaded. The deck had, just before the firing of the gun, been swept clean. This immediately attracted a great amount of attention, and I forthwith sought to discover the cause of such a serious waste, which was more than half, nearly two-thirds, of the charge. After much reflection, I was led to conclude that this waste was owing to the position of the vent-hole, placed as is usual at the extreme breech end of the bore; and my opinion has also been deeper impressed on my mind from having seen similar effects to the one above mentioned produced on the discharge of a rifle and ordinary fowling-pieces.

I refer to fig. 1 in the accompanying diagram, which is a longitudinal section of a piece of ordnance with the vent-hole placed, as is usually done, at A. We will now suppose the gun ready to be discharged, and, looking at the position of the vent-hole, we at once see that the fire is communicated first to the back end of the charge; immediately this takes place the gas is generated, and immense pressure follows, which causes a motion to take place whereby the front end or portion of the charge will be pushed forwards with the projectile at a high velocity, so that the fire cannot have time to reach through the whole length of it (the charge) before it has left the mouth of the gun; and so this front or unburnt portion of the charge appears to be blown away.

FIG. 1.

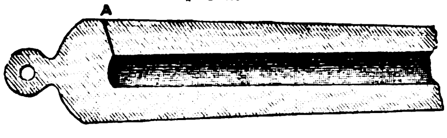
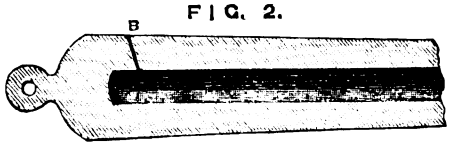


FIG. 2.



Now for the remedy, which may, perhaps, at once occur to your readers who are convinced thus far. I now refer to fig. 2, which is a similar longitudinal section to fig. 3, with the exception of the different positions of the vent-hole, which now is placed farther towards the mouth of the gun. In this position the vent-hole will come near about the centre of the charge; and on discharging, the fire will be communicated to the body of the charge, and will burn equally through it from the centre towards each end.

The advantages intended to be obtained by this arrangement of the vent-hole, are — 1st, that the fire commencing at the centre will communicate through and ignite the front half before it has left the gun, while the other half will burn backwards, and so continue a greater pressure, which will, in consequence, give the projectile a superior initial velocity, which is the desideratum so earnestly sought for. 2ndly, the whole of the powder being burned, thereby affecting considerable economy.

I much fear that my attempt at describing the supposed cause of the above named loss is very imperfectly done, though I trust sufficiently clear to be understood. It is my intention to conduct some experiments for the purpose of finding out the truth of the best position of the vent-hole, and shall then have much pleasure in letting you know the results. Should any of your readers be inclined to doubt what I have herein endeavoured to set forth regarding the quantity of unburnt powder being blown away, let him take his fowling-piece, or rifle, if he should have one, and load it, and place on the ground under his line of fire something such as paper or a few yards of calico, and, after firing, examine the paper or calico, and he will find it strewed with grains of powder in the same state as they were previous to being put in the gun.

I have the honour to be, sir, yours obediently,

St. John Vincent Day.

Newton Abbot: Aug., 1862.

Gossip.

In the manufacture of tin ware, there is a large waste of the raw material, in the shape of clippings and pieces; and as this waste consists of the two useful metals, iron and tin, attempts have been made from time to time to reclaim each metal separately, with a view to utilise them. The tin, which demands, from its great value, the highest consideration, is first separated from the iron by an acid, and afterwards, by chemical means, restored to the metallic state; but the difficulty has been hitherto to keep the restored tin quite free from iron — the presence of which, though in minute quantities, effectually neutralises the most valuable property of the tin. The great bulk of these clippings, however, is iron, which, by the process of heating and melting, can be reformed into bars; and as a large proportion of the tin-plates used in the manufacture of tin-ware is composed of charcoal iron, a very fair quantity of bar iron might with care be produced; but this can only be accomplished by the introduction of hammers into the furnace itself, whilst the iron clippings are hot, as from their slight substance they would not retain sufficient heat, if withdrawn, for the hammering process in the ordinary way. The subject is evidently worth attention, as many hundred tons of tin clippings must be produced annually in this country, the make of tin plates exceeding 600,000 tons, and the exports having trebled in the last ten years. There are about 6 or 7lbs. of tin to every 100 of clippings, so that in every hundred tons of this refuse material we should obtain (say) between 5 and 6 tons of tin, and perhaps 90 tons of iron.—*P. L. Simmonds on Waste Products and Undeveloped Substances.*

The robbery of Bank-note paper from the Laverstoke Mills is creating an immense amount of inconvenience in all parts of the kingdom; and in some places Bank-notes are positively refused to be taken at all. One natural result of the universal apprehension felt in regard to paper money is, that the demand for coin is largely increasing. The Bank coffers have consequently felt the pressure to a considerable extent, and their contents are rapidly diminishing. Fortunately, that establishment is fully supplied with gold bullion, and the Mint will no doubt be put into immediate requisition, with a view to its conversion into sovereigns and half-sovereigns. It is questionable, however, whether the mechanical capabilities of the Mint are sufficiently great to enable it to meet the sudden and unnatural demand made upon it. The number of stamping presses is far too small, we fear, to contend against the unprecedented strain. At the time of the erection of the Tower Hill Works, in 1810, eight presses were doubtless ample for all exigencies; but it does seem singular, that since that period no increase in their number, or in the speed with which they work, should have been made. The cost of an additional eight, or even sixteen, presses would not be very great; there is ample room for them within the Mint walls, and their existence would make it independent of all panics and pressure, from whatever source arising. We throw out this hint in all sincerity, and trust that it may obtain consideration in the quarter where such consideration is likely to lead to practical results. The large reward offered by the Bank for the discovery of the delinquents who have so successfully appropriated its paper, and no doubt diverted it to the most nefarious purposes, is a proof of the importance with which the crime and its consequences are regarded. It may be trusted that the hand of justice will speedily reach the perpetrators, and that the law will deal with them as they deserve to be dealt with.

A preliminary trial of an automaton semaphore target, the invention of Mr. G. W. Hart, of the 2nd Hants Artillery Volunteer Corps, took place on Saturday, at the practice range of the 5th Hants Rifles, near Portsmouth. Some hundreds of rounds were fired at the target at various ranges, and the results were of the most satisfactory character, the target signalling the effect of each shot instantaneously and correctly in every instance. It transmits thirteen signals — eight outers, four centres, and a bull's-eye. The centres are "high" and "low," left and right; and the signals in each case may be distinctly seen at the longest range, without any fear of being confounded with each other.

In California a powerful gold-mining hydraulic engine is formed by a high head of water conveyed through a pipe, and applied to wash down the face of gravelly hills and banks containing the auriferous deposits. Thus applied, water exerts a tremendous force in levelling hills and exhuming the golden nuggets. At Brandy City, in Northern Sierra, are rich and extensive diggings, which have been hard to work; but several of these powerful hydraulics have overcome all difficulties, and rendered the operations most productive. One of them has a fall of 240 feet through a 15in. iron pipe, and is said to be the most powerful in the State. It will lift boulders or detach masses of cement of a ton weight when brought to bear beneath them.

It is said that ebullition is produced when the globules come in contact with a solid. If, drawn by the currents which heating inevitably occasions, and they strike against the sides of the vessel, there is suddenly formed a bubble of vapour, the globule becomes rather smaller, is projected violently from the point at which it produced this kind of explosion, and then continues floating in the medium. If, when the temperature is above 115° or 120°, a globule is touched with a glass or metal rod, an explosion is produced at the point of contact, a bubble of vapour is disengaged, and the globule rebounds, as though the solid point exercised a sudden repulsion over it. However, all solids are not equally efficacious in producing this change of state; glass or metal rods sometimes fail, but a slender wooden or charcoal stick always incites an immediate and tumultuous ebullition in the middle of the over-heated globules. If a few drops of water are dropped into linseed oil, heated to 105° or 110° in a porcelain capsule, they fall slowly to the bottom of the vessel. The instant they reach it vapour is formed suddenly; the slightly diminished drop of water rebounds, then falls again, causing another disengagement of vapour; again it rises, and so on. The drops of water, while floating in the oil, before touching the bottom of the vessel, undergo no perceptible evaporation; it is only on their contact with a solid that there is a sudden production of a bubble of vapour.

The returns made of the quantity of coal conveyed to the metropolis by railway, canal, and seaborne, still show a very marked diminution. For the present year 755,850 tons 14cwt. of coal have been carried by railway, against 958,713 tons 11 cwt. for the corresponding period of 1861, or a decline of 182,862 tons 17 cwt. The canals show 6,722 tons, against 11,815 tons 15 cwt., or 5,093 tons 15 cwt. less this year than last. The seaborne coal has declined 53,072 tons, the quantity for the present year being 1,932,581 tons, as compared with 1,985,653 tons for the first seven months of 1861. For July last the London and North-Western Railway have conveyed 50,029 tons 1 cwt.; the Great Northern, 25,066½ tons; Midland, 14,588 tons; Eastern Counties, 12,256 tons; Great Western, 7,212 tons; Chatham and Dover, 243 tons 11 cwt.; Tilbury, London, and Southend, 60 tons; total, 109,455 tons 2 cwt., against 119,677 tons 15 cwt. in the month of July, 1861. The receipts by canal for the last month were 534 tons, against 1,690 tons for July, 1861. The importations from Newcastle have been 80,999 tons; Sunderland, 79,724 tons; Hartlepool and West Hartlepool, 57,397; Seaham, 24,959; Middlesborough, 4,427; Blyth, 2,264; from Wales, 9,553 tons; Yorkshire, 3,140; Scotch, 1,364. Of Duff, 1,550 tons; small, 1,313; and cinders, 2,358; making a total of 269,408 tons, against 290,918 tons for July 1861.

On Monday last, the Balloon Committee of the British Association made another ascent from Wolverhampton, Mr. Coxwell was the aeronaut; and Mr. Glaisher represented the Royal Observatory. The ascent was made about two minutes after one o'clock. The balloon contained, when it left the earth, about 65,000 cubic feet of gas. Mr. Prorad, engineer to the Wolverhampton Gas Company, had invented for the occasion an apparatus to test the specific gravity of the gas with greater accuracy than can be attained by any other instrument, in order that the lightest air might be used. The ascent was successfully made, and the balloon descended at five minutes past four, at Solihull, in Warwickshire, about 25 miles from where they ascended, after having attained a height of 4½ miles, where the temperature was 24°, the barometer about 13in., and the dew-point minus 10.

Mr. Roberts, of Millwall, has just completed a self-propelling steam fire-engine, which can also be used as a hoist, or to give motion to other machinery by means of a belt. In size it is about the same as those now in London. Steam has been got to 150lb. per inch from cold water. The water has been thrown to a distance of 176ft. through a 1⅜ jet; it will turn quite round in little over its own length, and has attained a speed equal to 18 miles an hour. Some further trials are to take place in a few days, when we hope to be able to give a fuller description of the machine.

In Paris, mica has lately been applied for preserving, silvering, and gilding decorations in churches and public buildings. The mica is first cut to the desired thickness with a knife, and is then coated with a thin layer of isinglass diluted in water, and the gold or other substance is applied, after which it is allowed to dry. A pattern of copper, with a design cut out on it, is then placed on the reverse side of the mica, and the superfluous parts are removed. The colours are then applied in one or several coats, and the whole afterwards coated with a solution of isinglass and diluted alcohol, by which the mica is rendered pliable. When this is effected, the mica is applied to the object, which is coated with glue or other adhesive material, and allowed to become comparatively dry, after which the surface is made smooth by rubbing it gently with an agate burnishing tool. The value of mica depends on the size of the sheets and their transparency, the clear ruby-tinged being the finest, and the cloudy grey the least valuable.

The new Dudley and Midland Geological Society held its inaugural meeting on Friday last, Lord Lyttleton in the chair; and the inaugural address was read by H. Beckett, Esq., F.S.G., which stated that the South Staffordshire coal field was well known to be rapidly approaching exhaustion, as far as regarded its anciently understood limits; and he felt that it could not be denied that, with a few honourable exceptions, a lack of scientific knowledge had been evinced in its explorations, which had done much to contribute to this sad waste of its invaluable treasures, and, what was of far greater importance—the fearful destruction of human life. After speaking of the great benefit to the district that must accrue from the adoption of a better system of mining, he maintained that the extraneous aid of a society like that might do much to bring about a better state of things. An excursion concluded the programme of the day's proceedings.

The *Stamford Mercury* says that the carpenters are now busy taking down the two windmills west of the Hammond Beck, which were erected in 1768, for the purpose of drawing off the waters from the lands in Bicker Fen. They were found quite inadequate for the heavy falls of rain in the spring of this year; therefore, after a consultation at a vestry meeting, it was determined to ask the advice of Messrs. Tuxford, the eminent engineers of Boston, as to the best means to be devised to prevent the lands from again being inundated. Those gentlemen recommended, instead of the windmills, that an Appold centrifugal pump should be erected, which could be worked at pleasure, by affixing thereto an ordinary thrashing-machine engine, which would throw off the land 5,600 gallons of water per minute, being twice as much as the mills would do under the most favourable circumstances, for when the rain came without wind they could not be worked. It was at once determined by the owners and occupiers of the Fen, which consists of about 1,400 acres, and who doubtless foresaw how it would enhance the value of their lands, to follow out Messrs. Tuxford's suggestion, and resolved to obtain the loan of 500*l.*, to be paid off in four years, which they easily did. They then appointed Mr. J. G. Trimnell to see that the work was properly executed.

At Chester, Conn., there is a mine 300ft. in depth, and extending several hundred yards horizontally into the bowels of the earth. Large masses of a white crystalline substance, streaked with yellow, are obtained in this subterranean artificial cavern; and these sparry crystals are used in large quantities for mixing with white lead paint. This heavy spar is the sulphate of baryta; it is ground in mills, and sold for about twenty dollars per ton. When mixed, weight for weight, with white lead, it is called Venice white; when mixed with one-third of white lead, it is called Dutch white. The purest white varieties are the most valuable, and for certain kinds of painting it is preferred to pure white lead. All lead paints become black when exposed to sulphurous gases; but these vapours have no such effect upon baryta.

The Board of Admiralty has fully approved the model of an improved armour-plated cupola vessel invented by Mr. Turner, master shipwright at Woolwich Dockyard; and one of these vessels is ordered to be constructed. The iron cupola will be fixed instead of movable, 260ft. long, 50ft. broad, and 10ft. deep. Guns will be placed round the vessel from fore to aft, and will be able to sweep the water at such a depression that no gun-vessel can approach. She will be fitted with a ram 3ft. under the surface of the water, 8ft. long; and her rudder-tiller and propeller will be under the water. The ship will carry 26 guns; and her dimensions will be as follow:—330ft. long, 64ft. broad, 25ft. draught, and 8,700 tons displacement.

The piers and abutments of the Divie viaduct, on the Inverness and Perth Railway, which is for carrying the Inverness and Perth Junction Railway across the valley and river Divie at Edinkillie, are now built to the level of the springing of the arches. This will be by far the highest viaduct in the north of Scotland, being more than 100ft. above the river. It consists of seven arches, each having a span of 45ft.; and the total length is 486ft. The piers and abutments are built from stone quarried in the immediate vicinity of the viaduct. The stones for the arching, most of which weigh more than a ton, are brought from Nairn by railway to Forres, and then carted to Edinkillie.

The Cleveland iron district appears to be steadily progressing. New works have recently been started at Stockton, for the manufacture of plates, which are said to have plenty of orders, chiefly for shipbuilding, for which a good price is paid in that district, and for which there is a large local demand in the neighbouring shipbuilding yards. A statement recently published gives the total number of blast furnaces in that district at 84, of which 59 are in and 25 out of blast, and this latter number includes 14 belonging to the unfortunate Consett Company. There are 14 more furnaces in blast than at the beginning of the year; and the district has been prosperous during the whole period of general depression.

Electric Light.—In reference to our notice of M. Serrin's electric light apparatus, we have received a letter from Mr. Henry Chapman, of St. John Street Road, in which he states that he invented and patented, in 1855, an apparatus which would produce a continuous electric light, and had overcome all the difficulties which M. Serrin claims to have been the first to accomplish.

An iron lattice foot-bridge is in course of erection over the railway, from High Street to Forge Street, Crewe.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

The Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

Steam Engines, &c., 310, 352, 354.

Boilers and their Furnaces, &c., 333.

Roads and Vehicles, including railway plant and carriages, saddlery and harness, &c., 323, 335.

Ships and Boats, including their fittings, 314, 315, 328, 330, 341, 343, 348.

Cultivation of the Soil, including agricultural and horticultural implements and machines, 311, 326, 331, 350.

Food and Beverages, including apparatus for preparing food for men and animals, 356.

Fibrous Fabrics, including machinery for treating fibres, pulp, paper, &c., 319, 342, 353, 355, 360.

Buildings and Building Materials, including sewers, drain-pipes, brick and tile machines, &c. *None.*

Lighting, Heating, and Ventilating, 324, 347.

Furniture and Apparel, including household utensils, time-keepers, jewellery, musical instruments, &c., 313, 321, 327, 329, 332, 334, 345, 346, 351, 358.

Metals, including apparatus for their manufacture, 349.

Chemistry and Photography, &c., 322, 338.

Electrical Apparatus, &c., 340, 359.

Warfare, &c., 320.

Letter-Press Printing, &c., *None.*

Miscellaneous, 312, 316, 317, 318, 325, 336, 337, 339, 344, 357, 361.

310. C. Calow and J. W. Hirst. *Improvements in slide valves for steam engines and other similar purposes.* Dated Feb. 6, 1862.

This consists in improved modes of equalising the pressure of the steam or fluid on the valve, so that it may be moved to and fro with ease, and at the same time be perfectly tight. *Patent abandoned.*

311. A. C. Bamlett. *Improvements in reaping and mowing machines.* Dated Feb. 6, 1862.

This invention is not described apart from the drawings. *Patent completed.*

312. J. Pitkin. *An improvement in aneroid barometers.* Dated Feb. 6, 1862.

This invention consists in connecting the index hand to a hollow spindle, which carries a toothed pinion at the back of the dial plate, and in fitting a toothed sector to engage in the teeth of the pinion, which sector is attached to a spindle moved by a watch or other similar key at the back of the instrument, in order to set the index hand. The spindle carrying the barometer needle passes through the hollow spindle, to which the index hand is attached. *Patent abandoned.*

313. R. Russell. *Improvements in stove grates and kitchen ranges.* Dated Feb. 6, 1862.

This applies, first, to stove grates and domestic fire-places and stoves generally, and consists in the construction of an ash-pan so as to radiate heat into the room, and to conceal the ashes from view. 2. To kitchen ranges only, and relates to the arrangement of the flues of an ordinary kitchen oven, so as to produce an even and uniform heat over all its surface. *Patent abandoned.*

314. R. Shortrede. *Improvements in the construction of ships of war with armour plates.* Dated Feb. 6, 1862.

Here the inventor proposes to make the plates solid in their defensive front, with flanges all round their inner edges adapted to their being bolted or riveted to each other through these flanges, thereby forming in effect one continuous plate. These armour plates will also be connected to the thinner plates covering the lower part of the hull by the upper row or tier of these lower hull plates having similar flanges, to which the flanges of the lower course of armour plates will be bolted or rivetted. *Patent abandoned.*

315. P. H. Astley. *Improvements in the construction of life boats, applicable also to ships' boats, gun boats, and other vessels.* Dated Feb. 6, 1862.

Here, instead of the bottom of a vessel being formed in the usual way, the same is to have the form of a hollow conic chamber or cavity running from stem to stern of the boat or vessel, the conic cavity having its base enclosed with a perforated bottom. The cone or cavity is built into two outer keels, converging from stem to stern, and enclosed at the bottom, which is perforated, and to which is added a centre keel as an easy means of transit from place to place. Axles and wheels may or may not be attached to the keels. In the centre, and on the top of the cone inside the boat, a stop-cock will be inserted whereby the boat's buoyancy can be regulated with any known and suitable air or pneumatic apparatus; or several conic cavities can be adapted for each vessel; and any suitable means of exhausting or compressing the air contained in the conic cavity or cavities, when on the water, may be adopted in connection with the invention. By these arrangements a vessel will be rendered a safe means of transit. *Patent completed.*

316. M. Henry. *Improvements in obtaining and applying motive power, and raising and forcing fluids, and in apparatus employed therein.* (A communication.) Dated Feb. 6, 1862.

This relates to obtaining and applying motive power by means of fluids; and also to pumping, raising, and forcing fluids. The apparatus employed is constructed on the following principle: If a wheel revolve within a closed chamber,

and have water or other fluid travelling freely through it, such fluid being admitted at the centre and discharged at the circumference, it follows that the dynamical effect of the stream of fluid when issuing from the closed chamber will be to the power that drives the vessel in inverse ratio to the proportion or relation between the sectional area of the delivery opening or outlet through which the fluid issues, and the sum of the sectional areas of the fluid ways or channels in the wheel through which the fluid travels; so that, supposing the delivery opening to be of a certain sectional area, and the wheel to have at its circumference a certain velocity, then the amount of power required to keep up such velocity will be so much the less in proportion as the velocity of the motion of transference with which the fluid moves from the centre of the wheel to its circumference, is reduced. *Patent completed.*

317. E. C. Willis. *Improvements in the treatment of wax and other substances of a similar nature.* Dated Feb. 6, 1862.

This consists in the use of charcoal as a bleaching or purifying agent for wax and analogous substances, such as spermaceti and paraffine. *Patent abandoned.*

318. E. T. Bellhouse and W. J. Dorning. *Improvements in the construction of hydrostatic presses suitable for packing and compressing cotton and other materials.* Dated Feb. 6, 1862.

This consists in a novel arrangement and combination of hydrostatic cylinders and rams, or of a hydrostatic cylinder or ram, with other mechanical contrivances, for compressing and packing into bales cotton, wool, yarn, fibre, hair, &c. *Patent completed.*

319. J. H. Johnson. *Improvements in the preparation of pulp for paper.* (A communication.) Dated Feb. 6, 1862.

Here the inventor makes use of damaged grass, beet root, pulp, and sea-weed, which he steeps in a bath of lime water. These materials are next steeped in a mixture of lime, salt of soda, salt of potass, nitric or muriatic acid, and water. They are afterwards dried, and treated with phenic acid, or with tri-nitrophenic acid, or with carbazotic acid. They are finally bleached by any known process. *Patent abandoned.*

320. J. Tonkin, Jun. *Improvements in the manufacture of gunpowder.* Dated Feb. 6, 1862.

The patentee claims: 1. The manufacture of gunpowder of a compound of charcoal, sulphur, and nitre, or nitrate of soda with vegetable fibre converted into gun cotton, or a substance analogous thereto. 2. The manufacture of gunpowder of a compound of charcoal, sulphur, and nitre, or nitrate of soda with fibre. 3. The granulating gunpowder by a machine consisting of an expressing cylinder or vessel, combined and working in conjunction with a die and endless apron, as described. *Patent completed.*

321. J. D. Dunnicliff. *Improvements in the manufacture of lace or net bonnet fronts and other similar articles, and in apparatus used in this manufacture.* Dated Feb. 6, 1862.

Here, in making bonnet fronts, &c., the lace or net is first goffered by machinery, as usual, before setting the goffered fabric into the band or otherwise, and whilst it is resting on a suitable table or surface the inventor causes an instrument to descend on to the top of the goffers. This instrument by pressing on the goffers, and by moving in the direction of the length of the fabric, throws them into an inclined position, more or less as required, and whilst the goffers are held in the inclined position, the fabric is set or pressed into the band. *Patent abandoned.*

322. R. A. Brooman. *Improvements in stereoscopic albums, books, and cases.* (A communication.) Dated Feb. 7, 1862.

This invention consists in combining a stereoscope with an album, case, or book, in such manner that both may be folded and occupy a small space. For stereoscopic albums, the glass sight-pieces are supported in a frame hinged to the album, which frame, when folded, lies flush with it. There is a plate below which also folds, for preventing the view being too expanded. A compass joint keeps the album open and at the required inclination. The views or portraits are inserted in a frame on the side opposite to that on which the stereoscopic apparatus is fitted. India rubber straps and pins are added for maintaining the sight frame in position. For a stereoscopic book, the sight frame is made as before, and a division plate, hinged to the case, supports it. The sight frame, case, and support, are divided centrally. To close up the book, the support is laid on one side against the case, the sight frame folded on it, with the support for the views on the latter; the whole apparatus is then folded and secured by a clasp. For a stereoscopic case, the views or portraits are arranged to slide on a roller inside and near the edge of the box, at the corners of which elastic springs are fitted supporting a movable plate for carrying the views; the tension of the springs is regulated by means of a ring, through which a rod passes, worked by a screw outside the case, or by any other convenient means. *Patent completed.*

323. J. Lloyd. *Improvements in buffers for engines and carriages on railways.* Dated Feb. 7, 1862.

This invention consists in connecting each buffer-head of every pair of buffers to one end of a rod, the opposite end of which rod is attached to one end of a transverse spring, which is held at its centre in such manner as to allow of its rocking or oscillating when greater pressure is applied to one buffer-head than to the other. Supposing the carriages in a train to be fitted with these improvements, the whole of the buffers will remain in contact, even while travelling round curves, the additional pressure while so travelling on the inner buffers having the effect of forcing out the outer buffers, and of thus keeping both the inner and outer set to the curve in contact. *Patent abandoned.*

324. P. Shaw. *Improvements in lamps.* Dated Feb. 7, 1862.

The patentee claims: 1. Constructing lamps for burning paraffine oil and some other fluids with a vessel for containing the oil, made of glass or other bad conductor of heat, surrounded with a vase or holder capable of being ornamented with any desired design, or of being made of any required shape, all as described. 2. Surrounding the air-tube or rod which passes through the oil vessel with a ferrule or tube of glass, or some other bad conductor of heat, as described. *Patent completed.*

325. H. A. Silver. *Improvements in the manufacture of trays, cases, and other similar articles and bottles, in ebonite, vulcanite, or other hard india rubber.* Dated Feb. 7, 1862.

In manufacturing cases, the patentee forms the top and bottom of plates or sheets of previously prepared ebonite or hard india rubber, and he unites them at the sides and ends, all or some of such sides and ends as may be required, by means of strips or sheets of india rubber and sulphur, prepared for vulcanising in a soft state. He unites the soft rubber to the ebonite by india rubber solvent or cement, and then subjects the whole to the ordinary heat for curing the soft rubber. For trays, the top plate is dispensed with. In manufacturing bottles he makes them in two parts: he forms the lower part in one piece or cup on a mandril, and forms the upper part and neck in a separate piece, and converts both parts into ebonite, vulcanite, or hard rubber, in the usual manner. He thins off the edges of the two parts, places one within the other, and applies both inside and outside, or outside only, a strip of rubber prepared for vulcanising in the soft state, using india rubber solvent or cement as before. He next subjects the whole to the curing process, and when the soft rubber has become converted, he turns down the projecting surfaces at the joint, and the bottle is completed. *Patent completed.*

326. W. E. Gedge. *An improved portable thrashing and winnowing machine and apparatus for working same by horse-power.* (A communication.) Dated Feb. 7, 1862.

We cannot here devote space to the voluminous details of this invention. *Patent abandoned.*

327. A. M'Kenzie. *Improvements in sewing machines.* Dated Feb. 7, 1862.

This relates to the arrangement and construction of sewing machines, which are so arranged that, by a simple mechanical movement, the sewing may be put in the fabric in lines at right angles to each other, or, in other words, the fabric may be sewn longitudinally, and then in the transverse direction, without requiring the fabric to be turned round. The machine is also arranged to sew articles of a tubular kind, like boot legs, or circular seams, with greater convenience than heretofore. *Patent completed.*

328. W. Clark. *Improvements in preserving timber, which are particularly applicable to timbers of ships or other maritime structures.* (A communication.) Dated Feb. 7, 1862.

This consists: 1, in depriving the wood of its sap, and, consequently, of its fermenting properties; 2, in submitting the wood to an artificial desiccation; 3, in singeing the face of the wood, when the work is finished, by a slight carbonisation. To deprive the wood of its sap, it is plunged in soft water, which, being less dense than the sap juices, forces out the latter, and fills all the fibres of the wood in its turn. The wood is dried by means of an apparatus of Messrs. Légé and Henry Piromet's, for injecting poplar and beech woods with sulphate of copper. The wood is now ready to receive a current of heated air, with which a certain quantity of sulphuric acid is mixed, which prevents the formation of fungi on ships' bottoms. A paint composed of sulphur, linseed oil, and boiled oil, is applied to the bottoms of ships. The surface of the wood is charred by a jet of gas. *Patent completed.*

329. H. Macaulay and A. F. Notley. *Improvements in fire guards.* Dated Feb. 7, 1862.

Here a fire-place, or a stove set therein, is arranged to admit of a guard passing into and out from one or both sides, and such guards may be made of wire-work, sheet metal, or other suitable material, and when intended simply to prevent dresses coming to the fire, or the flying out of cinders from the fire, the guard may be of open wire-work, or otherwise of a reticulate character; but when it is intended to be for a shade or other covering of the fire or front of the grate, then the guard may be close, or perforated, or reticulated to a less extent. It is preferred that each guard for a fire-place should be formed into two parts, one arranged to slide in and out on one side of the fire-place or stove, and the other to slide in and out on the other side. *Patent abandoned.*

330. W. H. Bartholomew. *Improvements in barges or vessels suitable for the navigation of canals and rivers.* Dated Feb. 7, 1862.

This consists in so constructing barges that they may be coupled together end to end, there being in the centre of the stern of each barge a projection, which, when several barges are coupled up into a compound vessel, enters a corresponding recess of the stern of the barge in front of it. The steering of the compound vessel is, to a great extent, effected by means of chains. *Patent completed.*

331. H. Brinsmead. *Improvements in apparatus for mowing, elevating, cleaning and dressing grain.* Dated Feb. 7, 1862.

This consists in arrangements for simplifying the operations of mowing, elevating, awning or hummelling, chobbing (that is, removing the calyx or white coat from the kernel), cleaning, and dressing grain, and may be used either in connection with thrashing machines or otherwise, and effects simultaneously the whole of the operations mentioned above. The apparatus consists of a rotary fan having a chob, cleaner, and awner on one or both sides, the moving parts of which the inventor by preference attaches to the shaft or spindle which carries the fan-arms or blades, or to the arms or blades themselves. The fan is fed with air by one or more tubes of any convenient section, communicating with one or both sides of the fan, as may be desired. The grain to be operated upon is introduced into this tube or tubes, and by the current of air therein is moved towards the fan. Between the aperture or apertures for the inlet of air to the fan, and the revolving fan-blades or arms, there is placed a diaphragm formed of perforated plate, wire-work, or other material pervious to the air, but not to the grain, by which the air that has moved the grain is separated from the grain which remains in the chob cleaner and awner. These are placed at the side or sides of the fan or fans, and after operating on the grain as much as convenient, deliver it by their centrifugal action through suitable spouts or shoots at such places as may be desired. When the invention is applied to thrashing machines, the inventor uses the whole or a portion of the current of air issuing from the fan for those purposes. *Patent abandoned.*

332. G. S. Woodhouse. *Improvements in hooped skirts.* Dated Feb. 8, 1862.

Here the lower portion of the skirt is made in the usual way with concentric hoops of metal, or other sufficiently elastic material, the same gradually diminishing in diameter as they approach the waist; these hoops are connected by the fabric of which the skirt is composed, or by other means. The upper part of the skirt is constructed with parallel strips of metal, or other material; such parallel strips, however, do not extend to the front of the skirt, which consists wholly of the fabric before alluded to. In order to render the portion of the framework consisting of the parallel strips more rigid and capable of supporting the weight of the external dress without collapsing or becoming depressed, strips of metal are placed transversely across the horizontal strips, and connected therewith at any desired angle or angles, thus constituting the bustle. *Patent abandoned.*

333. J. Howie. *Improvements in regulating the consumption of fuel in furnaces.* Dated Feb. 8, 1862.

Here the inventor conveys a portion of steam from the boiler in a pipe (a small pipe being preferred) to underneath or into the furnace, and allows the said steam to escape evenly under the bars, when it will pass up through the furnace. The application of steam in this way is suitable for any kind of furnace where there is sufficient heat. *Patent abandoned.*

334. J. A. Knight. *Improvements in washing machines.* (A communication.) Dated Feb. 8, 1862.

This consists in the use of a light barrel, or other vessel, on one end of which is attached inside a circular "rubber board" or corrugated surface, and on the opposite end inside is secured a series of pins or other projections. The machine is supported by two trunnions fixed on opposite sides thereof, the trunnions resting on a frame or stand. By the longitudinal revolution of the machine, the articles to be washed are precipitated from end to end, bringing them alternately in contact with the "rubber board" and pins, so as to secure the desired object. *Patent abandoned.*

335. F. Tolhausen. *An improved system of manufacturing the tyres of railway wheels by hydraulic pressure and steam.* (A communication.) Dated Feb. 8, 1862.

This relates to a novel system for applying pressure to the rolling of the wheel tyre, and to the preparatory shipping of the tyre on the wheel, the object being to render hydraulic pressure more obedient or subservient to the operations, and also to obtain certain advantages both with regard to quality and the cost of manual labour. In order to tyre a wheel, the inventor subjects the iron or steel bar to three distinct operations: 1, winding the bar on a cylinder, the same being seized between a headstock and a hydraulic piston, which shapes the blank or hoop; 2, the hoop is hammered as usual, but he uses a savage with a movable or "universal" mandril, by which the removing operation is greatly facilitated; 3, the hoop is then rolled under an upper horizontal roller, the axis of which is acted upon by hydraulic pressure by means of a hydraulic pressing-box. *Patent completed.*

336. J. Webster. *An improvement or improvements in the manufacture of certain descriptions of nails, bolts, spikes, and pins.* Dated Feb. 8, 1862.

This consists in making nails of the kind used for sheathing ships, bolts, spikes, and pins used in ship-building, securing railway chairs, &c., by forming them triangular in cross-section, and afterwards twisting them slightly in the direction of their length, so that, while no impediment is offered to the driving of the nail in the usual way, it takes more power to draw it again. *Patent abandoned.*

337. J. Carrington. *Improvements in the construction and fitting up of stal's and horse-boxes.* Dated Feb. 8, 1862.

Here the object is to provide stables with stalls or boxes, and fittings of an improved construction, which, amongst other advantages, will admit of being readily removed when required, without defacing the walls of the building to which they are applied; will give increased facilities for flushing drains, and provide an efficient means for accustoming young horses to the bit. The invention is not described apart from the drawings. *Patent completed.*

338. M. A. F. Mennons. *Improvements in the treatment of coprolites and other fossil phosphates of lime.* (A communication.) Dated Feb. 10, 1862.

This relates to a method of treating coprolites and other calcareous phosphates, by which these minerals are converted into assimilable manure, and at the same time are rendered applicable to the disinfection of certain animal products, and to the extraction therefrom of fertilising principles. The nodules or rocky phosphates to be operated on are first pulverised as finely as possible by any suitable machinery, and with the powdered mass is intimately incorporated from six to ten per cent. of organic matter, highly charged with hydrogen and carbon, say, for instance, the pitch or tar produced during the distillation of coal in gas manufacture. The mixture is then calcined at a temperature of from 400° to 500° (Centigrade) in closed and luted kilns, retorts, or other suitable capacities, each containing a minimum of four hundredweight. In this the tary matter is decomposed, the hydrogen unites with the sulphur of the sulphuret of iron, forming sulphuretted hydrogen, which is thrown into the furnace and there consumed. The carbon reduces the metallic oxides, divides the molecules, and assists the conversion of the sulphurets into carbonates, which afterwards pass to the state of oxides, the carbonate of lime especially being converted into oxide of calcium (quicklime). The water and carbonic acid are driven off, and the excess of carbonaceous matter takes their place. When the disengagement of gas ceases (generally in from half an hour to an hour with the quantity above noted), the operation is suspended, the product is withdrawn from the recipient, and placed to cool in sheet-iron dampers. *Patent completed.*

339. M. A. F. Mennons. *Apparatus for the administration of vapour baths.* (A communication.) Dated Feb. 10, 1862.

This invention is not described apart from the drawings. *Patent completed.*

340. J. Dickson. *Improvements in voltaic apparatus and in the production of voltaic electricity.* Dated Feb. 10, 1862.

The discovery upon which this invention is based is that, by raising the temperature of the electrotypes and substances used in the evolution of voltaic electricity, the facility of colouring such electricity from the substances now usually used for that purpose is increased, and, further, that the increase of the electric fluid obtained by this method is such as to render certain cheap and easily procurable materials (from which the electric fluid has not by any means hitherto known been obtained in quantities sufficient to warrant their use in manufacturing) remuneratively available for the purpose of such manufactures. The substances used are iron, zinc, lead, and carbon. *Patent completed.*

341. R. Philp and J. Philp. *An improvement in propellers for propelling ships, boats, and other vessels in water.* Dated Feb. 10, 1862.

This relates partly to the form of the blades, and partly to their relative position on the boss, and is as follows:—The inventors increase the surface of the blades at the outer extremities of their leading edges, while they cut away the

corresponding portions of the delivery edges, so that the horizontal distance between the leading corners of the crowns, when the delivery edges are perpendicular, is greatly increased for the same diameter of propeller and surface of blade over the corresponding distance between the leading corners of propellers hitherto in use, while at the same time the horizontal distance between the delivery corners is reduced as near as may be to a point. The blades so placed spread out laterally on each side until they make but one angle instead of two vertical angles, as in propellers hitherto made (as near as may be), viz. at the delivery corners, as seen by a spectator looking through the propeller from one corner to the other. *Patent abandoned.*

342. J. BUSFIELD and J. EASTWOOD. *Improvements in machinery or apparatus for preparing wool for dyeing and spinning.* Dated Feb. 10, 1862.

This relates to means for producing uniformity of twist in slivers of wool preparatory for the dyeing process, and also for taking out the twist of slivers of wool preparatory for drawing and spinning. The apparatus consists of suitable framing, on which are mounted two pairs of nipping rollers for drawing the slivers forward from the ball, which is placed in a receptacle or cylindrical vessel mounted centrally upon a vertical spindle, to which variable rotary motion is given by a friction wheel applied to the bottom of the vessel, which forms a friction plate. This friction wheel is capable of sliding on a shaft by which it is driven, and receives rotary motion through a train of gearing from the drawing roller. The said friction wheel is moved to or from the spindle or central of the cylindrical vessel by a rod connected to a stud plate or crank fixed on a shaft, to which rotary motion is also communicated by the gearing, and which is so arranged as to produce or give any desirable variation of speed to the vessel. A ball of sliver is placed on the vessel, and the inner end of the said sliver is passed through a central hole in a portable rail placed across the top of the vessel, and thence betwixt one of the pairs of rollers to the other pair, which draws it forward at an uniform speed. If it be required to produce twist in the sliver, then the friction wheel is placed or arranged so as to act upon the outer part or edge of the plate or button of the vessel at the commencement, giving a slow motion thereto, which gradually increases as the friction wheel moves nearer to the centre of the plate. *Patent abandoned.*

343. B. C. PIM and G. FAWCUS. *Improvements in uniting iron plates and in uniting and fixing armour plates on ships and other structures.* Dated Feb. 10, 1862.

This invention consists in uniting iron plates to one another by means of double-shafted keys or rivets, which the inventors drive into dovetail grooves formed in each of the plates to be united. The double shafts are united and form but one piece by means of a web, which, when the parts are in position, comes in the same plane as the seam between the two plates. The grooves may be of the regular angular dovetail, or they may be circular, or of any other suitable form, but of course must correspond with that of the key. When for the purpose of uniting armour plates, and fixing them to any structure, they form one or more slots through the key or rivet at that part which, when in position, will come behind the structure to which the plates are to be fixed, and they insert pins into the said slots. In addition to this means of fastening, or in substitution for it, they sometimes taper off the double-shafted key or rivet into one shaft at the point, thread it, and, after passing it through a hole in the framework of the structure, fasten up by a nut. *Patent abandoned.*

344. L. R. BODMER. *Improvements in hydraulic oil presses.* Dated Feb. 10, 1862.

This relates to certain improvements upon and modifications of the hydraulic oil presses, for which letters patent were granted to the present inventor on Dec. 20, 1855 (No. 2,886). The objects of the present improvements, which are applicable to all vertical hydraulic presses, are to economise labour and time in the working of the press, and to dispense with the bags or wrappers for the seed or other oleaginous matter; such, for instance, as the cocoa-nut, from which the oil is to be extracted by pressure. The inventor prefers the seed holders should be of a cylindrical form. *Patent abandoned.*

345. G. SMITH. *Improvements in shawls.* Dated Feb. 10, 1862.

Here the patentee proposes adding to shawls an extra piece or pieces of the same or other fabric (which, for the purpose of explanation, he terms leaves), either by weaving, sewing, or other means, so that, when the shawl is worn, it may present at the back two, three, four, or any number of separate "leaves" falling within the size of each other externally, and all within the size of the shawl itself, to which the leaves are attached. *Patent completed.*

346. J. DANKS. *Improvements in the manufacture of door-mats and hearth rugs.* Dated Feb. 10, 1862.

This relates to the manufacture of mats and rugs composed of cocoa-nut fibre, or partly of cocoa-nut fibre combined with wool or other material, with a pile face on each opposite surface thereof, so that their surface may be used as the upper surface, and considerable economy with other advantages in use are thereby obtained. For this purpose, in place of using a number of back-chain or warp-threads to each row or series of tufts of piles of which the mat or rug is composed, as is the practice when making door-mats of cocoa-nut fibre with one pile surface, the inventor finds it necessary to use two, one upon which a row of tufts of pile for one surface are formed, and the other for a row of tufts of pile for the opposite surface; and these chain or warp threads, with their rows of pile, being repeated according to the width or length of mat or rug required, are connected together by shoots of weft. *Patent abandoned.*

347. W. CLARK. *Improvements in reflectors.* (A communication.) Dated Feb. 10, 1862.

This relates to reflectors for converging and concentrating the rays of light on one or more parts at the same time, utilising the whole of the rays of reflectors, which are at present in a great measure lost. The improved reflector is formed of a series of reflecting surfaces, the angles of which are calculated so as to direct or concentrate the luminous rays on one or several given points. *Patent completed.*

348. A. MUNCK and H. A. MYHRE. *Improvements in ships' logs.* Dated Feb. 10, 1862.

This relates to that class of ships' logs which have the registering apparatus placed on board, or attached to the vessel, and receive the motion of the rotator placed in the water by a line, and consists, 1, of a particular arrangement of the regulating gear, whereby the inventors bring the line of axis receiving motion from the rotator line in line with the axis of the indicating hands, which are 2, 3, or more, and all concentric the one with the other, like the hands of a clock; on the outer circle they indicate furlongs and miles, by preference up to five miles, on the next from five miles up to sixty miles, and on the inner circle from 60 to 720 miles. *Patent abandoned.*

349. W. CLARK. *Improvements in refining cast iron, wrought and other malleable iron, and in the cementation of iron.* (A communication.) Dated Feb. 10, 1862.

Both lighting gas and coal in the pure state possess sulphureted products, which would combine with the iron, and, as infinitesimal quantities of sulphur are sufficient to entirely change the quality of the iron or steel, it will be apparent that it is highly necessary to remove it. This may be effected by adding to the coal a certain quantity of lime, or carbonate of lime, which, at the high temperature to which the mixture is raised, becomes transformed into quicklime, and retains in the state of sulphuret of calcium not only the sulphur resulting from the distillation of the coal, but also that evolved in the furnace, which always filters in the cementing cases. The presence of the lime prevents an excess of sulphur being taken up by the iron, and also possesses the further advantage of removing the greater part of that which it previously contained; it thus purifies and refines the iron, and renders it more suitable for subsequent connection, and, in fact, enables good steel to be obtained from iron of inferior quality. *Patent abandoned.*

350. W. H. WEAVER and C. GALL. *Improved machinery for agricultural purposes.* Dated Feb. 11, 1862.

This consists in constructing machinery consisting of a suitable frame and appliances, having two or more rows or sets of tines, with these rows or sets secured upon one and the same axis, the ends of which axes are provided with quadrant-shaped pulleys, over and secured to each of which is a chain or rope, which passes the draught bars of the machinery, so that any one row or set of tines or implements is put in action, and that one row or set of tines or implements will thereby be withdrawn from the land, and another put to work, the row or set of implements in work being held in position by the draught of the machine, inasmuch as there is a similar chain arrangement and connecting bar, or other arrangement attached to another similar axis to that first mentioned. *Patent abandoned.*

351. T. FYFE. *Improvements in knapsacks, and in apparatus for supporting them or other suitable burdens upon the shoulders.* Dated Feb. 11, 1862.

This consists in a mode of constructing knapsacks, &c., whereby they are supported upon the back of the wearer by two horns or projections of metal or wood, such horns projecting one over each shoulder, and by certain suitably arranged straps in connection therewith. *Patent completed.*

352. C. BONELL and W. M. SPIRING. *A new or improved rotary engine.* Dated Feb. 11, 1862.

This invention consists of a rotary engine to be worked by steam or other vapour or gas, constructed essentially as follows:—The cylinder of the engine is very nearly, but not quite, circular in cross section, having a slightly elliptical figure. In the interior of the cylinder is a shaft or axis, the said shaft or axis being eccentric to the cylinder, one of the sides of the said shaft bearing against an elastic packing on one side of the cylinder, the said packing being in the shortest diameter of the cylinder. In a slot passing through the said shaft a plate or piston works, the said plate or piston forming a partition or diaphragm across the said cylinder, upon which partition or diaphragm the steam acts. As the steam is admitted into the cylinder between the elastic packing on which the shaft bears and one side of the piston, the said steam presses the piston forwards, causing it and the shaft to perform a rotation. The steam then escapes from the cylinder. A slight depression is made in that part of the cylinder at which the steam enters, so that when one side of the piston is brought over the steam passage, the said piston does not bear tightly upon the cylinder. A small portion of steam consequently escapes past the part of the piston in question, and, acting on the other part of the piston, carries it past what would otherwise be a dead point. The edges of the piston are provided with metallic packing. By the use of an ordinary slide valve the direction of the steam may be changed, and, consequently, the direction of the engine's rotation. *Patent abandoned.*

353. E. SUTTON. *A certain improvement in machinery or apparatus for preparing cotton and other fibrous substances for spinning.* Dated Feb. 11, 1862.

This invention relates to that description of machinery used in the preparation of cotton and other fibrous substances called the scutcher or opener, and is designed for the purpose of extracting dirt and dust therefrom. The improvement consists in the application and use of a perforated door or partition behind the beaters (that is, between the beaters and the exhausting fan), such door extending in a division across the width of the chamber or body of the scutcher. By this means the lighter dirt and dust are abstracted from the cotton through the perforations of the door by the exhausting action of the fan without allowing the filamentous substance to pass. *Patent abandoned.*

354. W. MACNAB. *Improvements in steam engines.* Dated Feb. 11, 1862.

The patentee claims: 1. The causing of the fresh steam in combined high and low pressure engines to give up a portion of its heat to the partly-used steam, substantially as described. 2. The combining together of two pairs of high and low pressure cylinders, with the individuals of each pair acting at right angles, as described. *Patent completed.*

355. W. LYALL. *Improvements in machinery for preparing flax, hemp, and other fibrous substances.* Dated Feb. 11, 1862.

These improvements are twofold, and consist: 1. In placing an additional gill carriage or carriages immediately above the present gill carriages or heads of the ordinary spreading or drawing frame, so as to form one machine, whereby great economy of space, labour, and first cost are judiciously effected. 2. In wetting or damping the fibrous bands or slivers in their progress through the aforesaid machines, thereby making them better adapted to undergo the various processes which finally convert them into yarn. In the first improvement the patentee bolts the sides or standards of the top and bottom carriages together, or they may be cast in one, the bottom carriage being bolted to the usual longitudinal rails, which are again connected by the frame ends. Sufficient distance is left betwixt the upper and lower heads to allow all the parts to work freely and independently. The driving pulleys are placed in a position common to both carriages. The slivers which issue from the top delivery rollers may either fall into their respective cans at once, or pass betwixt the delivery rollers of the lower head into the same can with the bottom slivers. The damping of the slivers is effected by a sponge or other suitable material pressed gently on the sliver betwixt the drawing and delivery rollers, whilst the machine is in operation, but withdrawn immediately on the stoppage of the same by a series of levers in connection with the belt motion. The sponge is supplied with water by an india rubber or other flexible tube communicating with a small cistern, the water in which is kept at the same level, in order to give a regular supply. The cistern is placed in a suitable position to allow the water to gravitate to the sponge, and the supply is stopped by compressing the flexible tube immediately on the stoppage of the machine. The sponge need not be applied to every sliver, but to one or more, and the doubling of the sliver diffuses the wet through all. *Patent completed.*

356. W. WOOD. *Improvements in the manufacture of pomfret or liquorice cakes.* Dated Feb. 11, 1862.

The dough or paste, omitting the liquorice and some other materials, is, according to this invention, first prepared and subjected to heat in a pan; the extract of liquorice and other materials are then combined with the paste or dough on a metal or other suitable table, heated in any convenient manner, such table having one or more rollers so placed that they rest thereon, or are at any desired distance therefrom, and they are either moved upon the table, or the bearings of the rollers may be fixed and the table be continually moved under the rollers. Scrapers are also used to move and turn the materials on the table, so that by the combined action of heat, and the pressure or rubbing of the rollers, the materials are intimately mixed, and at the same time dried to any desired consistency. By the action of a screw or other form of pressure acting with moulds or dies, the cakes are rapidly produced without being handled, and by using a series of moulds or dies, several or many of such cakes are made at the same time, each marked or ornamented on one or both sides by the moulds or dies being properly formed with the desired devices and names. *Patent completed.*

357. J. H. JOHNSON. *Improvements in smoothing irons.* (A communication.) Dated Feb. 11, 1862.

This invention relates to smoothing irons having two faces, and made reversible, so that one face may be heated while the other is in use. According to this invention the iron is heated by gas jets issuing from a pipe inside the iron, such pipe being secured to an end plate which allows the iron to be reversed, and enables it to be locked in its proper position by a spring catch. The jets are surmounted or enclosed by a small chamber covered with wire gauze, whereby the prevention of smoke is effected; a gas cock in connection with a flexible tube is soldered to the outside of the loose end plates above referred to, or a small nozzle only may be soldered thereon, over which the end of the flexible tube is passed and secured, the gas cock in that case being at the other end of the tube, or in any convenient part thereof. *Patent completed.*

358. J. BRINSMEAD. *Improvements in pianofortes.* Dated Feb. 11, 1862.

This invention is not described apart from the drawings. *Patent completed.*

359. R. JOHNSON. *Improvements in welded wires used for telegraphic purposes.* Dated Feb. 11, 1862.

This invention has for its object the strengthening of those joints which are produced by welding, and the maintenance of a continuity should the welding give way. These advantages the patentee proposes to attain by protecting the said joints with a metal covering, and this he forms by winding wire or other such material around the joint, so that, should the welding break, the said wire will still constitute a connection or conducting medium. By a subsequent process of galvanising the whole becomes soldered together. *Patent completed.*

360. G. LINDEMANN. *Improvements in applying gas for the purpose of singeing or dressing yarns or threads and woven fabrics, and for obtaining heat for other purposes.* Dated Feb. 11, 1862.

This invention consists in submitting yarns or threads and woven fabrics to the action of the flame of gas, which is caused to rotate by giving an axial motion to the burner; and the patentee also applies the said revolving flame to surfaces used for drying, or to other purposes where heat is required. *Patent completed.*

361. J. J. M'COMB. *An improved fastening for securing cotton and other bales or packages.* Dated Feb. 11, 1862.

The patentee claims connecting together the looped ends of metal bands, surrounding cotton and other elastic bales or packages, by means of a metal buckle constructed as set forth. *Patent completed.*

PROVISIONAL PROTECTIONS.

Dated June 3, 1862.

1676. J. Fincham, Beck Row, Mildenhall, Suffolk, machinist. Arrangement or arrangements of mechanism useful for facilitating the repairing of roads and ways, also applicable to the tilling of land.

Dated July 17, 1862.

2043. M. Kurts, 151 Bishopsgate Street Without. A new or improved material to be used in the manufacture of handles for umbrellas, parasols, and walking-sticks.

2045. H. Appleby, Tavistock Place, Plumstead, Sergeant-Major in Her Majesty's Royal Body Guard. Improvements in armour plates for ships of war, floating and land batteries, and other like purposes.

2047. J. Schloss, Cannon Street, manufacturer. Improvements in pouches.

2049. T. B. Daft, 2 Queen Square, Westminster. Improvements in the manufacture of vulcanised india rubber thread.

Dated July 18, 1862.

2055. J. S. Jarvis, Wood Street, warehouseman. Improvements in shirt collars.

2057. C. A. Day and T. Summers, Northam Iron Works, Southampton, engineers. Improvements in sheer legs.

Dated July 19, 1862.

2059. G. J. Yates and J. W. W. Tindall, Liverpool, chemists. A process of deodorising paraffin, coal, pitch, rock, and other like oils and hydro-carbons.

2061. R. A. Brooman, 166 Fleet Street, patent agent. Improvements in revivifying animal black, in apparatus employed therein, and in recovering a product employed in the revivification. (A communication.)

2063. A. Pratt, Devonshire Place, Wandsworth Road. Improvements in self-capping firearms.

2065. W. E. Newton, 66 Chancery Lane. Improvements in machinery for preparing fibrous substances for combing. (A communication.)

2067. W. Tranter, Birmingham, gun manufacturer. Improvements in firearms.

Dated July 21, 1862.

2070. E. Bazin, Angers, France, engineer. An improved electric railway carriage signal.

2073. A. M. Fell, Auchanhard, Linlithgowshire, manufacturing chemist. Improvements in obtaining or manufacturing sulphate of ammonia and manure.

Dated July 22, 1862.

2077. T. Meriton, Hamburgh, engineer. Improvements in steam-engine governors and speed regulators for machinery.

2079. P. F. Cassegrain, Paris, gentleman. Improvements in firearms.

2081. Dr. W. Smith, Over Darwen, weaver. Certain improvements in power looms for weaving.

2085. W. Croits, New Lenton, near Nottingham, lace manufacturer. Improvements in the manufacture of fabrics by lace machinery, and in the means or apparatus employed therein.

2087. H. R. Summons, Navarino Terrace, Dalston Road. Improvements in machinery or apparatus for bordering envelopes, paper, and cards.

2089. G. Payne, Grantham, Lincolnshire, shoeing smith. Improvements in horse shoes.

2091. A. C. Vautier, Paris. Improvements in obtaining fibrous materials, and in manufacturing paper pulp, also in preparing, bleaching, and treating fibrous materials and fibrous and textile fabrics, and in producing agents used in part of the invention.

Dated July 25, 1862.

2116. W. Clark, 53 Chancery Lane, engineer. Improvements in rafts or structures applicable for the ordinary purposes of marine and inland navigation, as also for saving life in cases of shipwreck or otherwise. (A communication.)

Dated July 29, 1862.

2152. G. Waldie, Linlithgow, printer. Improvements in colour printing, and in the machinery or apparatus employed therein.

Dated July 30, 1862.

2162. W. Wanklyn, Albion Mills, Bury, cotton spinner. Improvements in apparatus for opening and conditioning East Indian and other tightly-compressed cottons.

Dated July 31, 1862.

2170. E. F. Prentiss, Birkenhead, chemist, and R. A. Robertson, Liverpool, brewers' and distillers' engineer. Improvements in obtaining products from rock oil, coal tar, and other like mineral substances, in a more or less pure and deodorised state, and in the apparatus to be used therefor, and which is also applicable to distillation in general.

2172. J. & E. Ransom, Kempston, Bedfordshire, millers. Improvements in mounting mill-stones.

Dated August 1, 1862.

2178. J. Sinclair, Glasgow, manufacturer. Improved arrangements for ventilating, and in part applicable for fumigating.

2180. G. Haseltine, 100 Fleet Street, American barrister at law. Improvements in apparatus for drying grain, gunpowder, and other granular substances. (A communication.)

2182. J. C. Onions, Birmingham, portable forge manufacturer. Improvements in portable forges.

2184. J. E. Marsh, Birmingham, rivet manufacturer. An improvement or improvements in metal rivets used in joining or securing together parts of boots, shoes, and other articles of leather, and also in machinery for making such rivets.

Dated August 2, 1862.

2188. T Onion, Calais, France, engineer. Improvements in rotary steam engines and in propellers adapted to propelling vessels in water.

2190 J. Gray, Glasgow. Improved arrangements for cleaning ships' bottoms, and for preventing the fouling thereof.

2192. C. Warne, Syleham Mills, near Scole, Norfolk. Improvements in the manufacture of linen drabbett.

Dated August 5, 1862.

2196. J. Thoma, Prussia, 35 Poland Street, Oxford Street. An improved self-adjusting screw wrench.

2202. A. Priestley, Huddersfield, machine broker. Improvements in arrangements or apparatus applicable to locomotive railway engines and carriages for distributing sand upon the rails to give adhesion to the driving and brake wheels of such engines and carriages.

Dated August 6, 1862.

2204. J. C. Richardson, Lichfield, manufacturer. An improvement or improvements in cleaning cotton waste.

2206. W. G. Valentin, Royal College of Chemistry, Oxford Street, chemist, and F. Levick, Blaina, Monmouth, ironmaster. Improvements in the generation of combustible gases for lighting and heating purposes, and in the mode of applying such gases to the manufacture of iron, glass, and other processes in the arts where great heat is required.

2208. J. H. Johnson, 47 Lincoln's Inn Fields, gentleman. Improvements in the construction of armour plates for ships and forts, and applicable to other like purposes. (A communication.)

Dated August 7, 1862.

2210. C. Culling, Downham Market, Norfolk, gunmaker. Improvements in firearms.

2214 R. A. Brooman, 166 Fleet Street, patent agent. Improvements in ships and vessels in order to prevent injury from collisions. (A communication.)

2216. W. Clark, 53 Chancery Lane, engineer. Improvements in the rig, spars, and sails of ships and other vessels. (A communication)

2218. R. W. Ralph, Honnington Grange, near Newport, gentleman. Certain improvements in, or applicable, to reaping machines.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

965. S. Fielding, S. Fielding, jun., R. Fielding, and T. Fielding. Valves.
971. M. Walker. Breech-loading rifles and other fire-arms.
972. W. Begg. Consuming smoke.
974. J. Colling. Reefing ships' sails.
975. A. Clark. Manufacture of revolving window shutters and blinds.
977. R. A. Kobitzsch. Diving apparatus.
980. C. S. Duncan. Apparatus for ventilating.
989. J. Carrington. Bricks.
997. F. W. Brearey. Medicated cups or vessels.
998. E. H. C. Monckton. Time keepers.
1004. J. Wright. Joining together armour and other thick metal plates, beams, and girders.
1005. T. Cobley and J. Wright. Treating auriferous and argentiferous minerals.
1007. J. E. H. Andrew. Looms for weaving.
1010. J. & J. Bullough. Looms for weaving.
1013. J. Jones. Constructing and arming ships and vessels.
1016. J. Knowelden. Steam, water, and other fluid engines.
1023. W. Nunn. Lanterns.
1024. J. Houghton. Haversack.
1031. J. Platt, W. Richardson, and W. Holland. Carding engines.
1032. J. Petrie. Apparatus for blowing and exhausting air.
1033. G. Burge. Protecting forts.
1034. C. Bartholomew and J. Heptinstall. Manufacture of tyres.
1043. W. E. Gedge. Lamp.
1047. T. Knowles, J. Houghton, W. Knowles, and W. Houghton. Looms.
1048. E. Butterworth. Applying adhesive substances to preserve the form of cops of yarn.
1051. J. H. Johnson. Fire-arms. (A communication.)
1058. E. Drewett. Bottles and other vessels.
1059. A. S. Campbell. Surface condensers.
1060. A. S. Campbell. Refrigeration of liquids.
1061. J. Park. Steam engines.
1062. E. Peyton and W. F. Batho. Angle iron.
1063. J. F. Spencer. Steam engines.
1069. J. K. Hampshire. Safety cage.
1075. R. A. Brooman. Pumps. (A communication.)
1076. R. A. Brooman. Hobby horse. (A communication.)
1077. C. J. Coxhead. Pianoforte actions.
1081. F. A. Le Mat and C. F. Girard. Fire-arms.
1082. R. Roche. Gun carriages.
1086. J. Platt and W. Cheetham. Looms.
1087. J. Platt and W. Richardson. Cleaning wool.
1088. R. A. Peacock. Constructing and working lock gates for docks, harbours, canals, and navigable rivers.
1091. F. C. Philippson. Steam hammers.
1098. W. F. Lock. An elongated projectile to be shot from smooth bored ordnance, and which shall retain, during its flight, the longer axis in the direction of its line of flight, similarly to elongated projectiles propelled from rifled ordnance.
1104. F. P. Warren. Steering sea-going vessels.
1105. M. Cartwright. Manufacture of models, and of plates or pieces for artificial teeth.
1110. J. H. Johnson. Machinery or apparatus for cutting the teeth of wheels, racks, or segments. (A communication.)
1122. J. Murphy. Looms.
1128. R. A. Brooman. Taps and valves. (A communication.)
1129. R. A. Brooman. Buffing apparatuses and draw springs. (A communication.)
1133. W. Clark. Railway rails. (A communication.)
1134. J. C. Rivett and J. M. Hetherington. Preparing cotton and other fibrous materials for spinning.
1135. R. Wedgwood. Apparatus for facilitating the saving of life in cases of fire.
1138. J. S. Phillips. Propulsion of vessels through the water.
1141. R. Stuart, G. Stuart, and H. Hill. Fastening flyers upon spindles.
1148. A. N. Wornum. Pianofortes.
1175. R. Jinks. Apparatus for suspending, raising, and lowering Venetian blinds.
1177. W. Moir. Ascertaining the specific gravity of liquids.
1179. G. H. Birkbeck. Lubricating apparatus. (A communication.)
1224. W. E. Newton. Chimneys for lamps. (A communication.)
1230. W. Clark. Collars, wristbands, and cuffs. (A communication.)
1235. G. Bischof. Treating solutions containing copper and silver.
1285. W. E. Newton. Lamps. (A communication.)
1294. T. F. Griffiths. Raising or shaping sheet iron.
1319. S. Merolla. Fire-arms.
1320. W. E. Newton. Joining boxes. (A communication.)
1349. W. & J. Richard. Manufacture of printing types, spaces, and quadrats.
1400. G. C. Haseler. Manufacture of lockets.
1521. W. Naylor. Forging metals.
1779. J. F. Allan. Improved furnace arrangements to prevent smoke and economise fuel.
1874. G. Peterson. Ascertaining the quantity and strength of spirits or other products obtained by the process of distillation. (A communication.)
2007. T. Hill. Protection of markers at rifle-butts, and in the means employed in indicating the score and position of the shot, and wiping out the shot mark.
2043. M. Kurts. Manufacture of handles for umbrellas, parasols, and walking sticks.
2067. W. Tranter. Fire-arms.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed August 15, 1862.

410. J. Cooke.
413. J. Chatterton and W. Smith.
415. A. H. Harrison.
419. H. Crawford, J. Crawford, R. Crawford and R. Templeton.
428. R. Watkins.
430. J. Lees.
434. W. Firth.
435. C. T. Marzetti and J. Watson.
436. J. T. and G. Pendlebury.
441. N. Symons.
443. W. Hinton.
444. W. Davis.
445. J. Paterson.
448. J. Willcox.
450. J. Friedlaender.
455. J. Paterson.
456. J. Paterson.
457. C. Wood.
459. J. Spence.
464. E. S. Crease.
465. R. & W. E. Pickin.
467. W. M'Adam and W. Chrystal.
469. H. Chavasse, T. Morris, and G. B. Haines.
479. D. B. White.
483. W. B. Johnson.
505. W. Clark.
525. W. Miller.
527. W. Clark.
547. J. C. Ratliff.
585. J. Gjers.
601. E. Partington.
643. W. J. Bennet.
751. T. Dunn.
1182. A. Robertson and R. Barter.
1473. C. Attwood.
1651. W. E. Newton.
1653. W. E. Newton.
1798. J. H. Johnson.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1867. D. Campbell.
1936. T. Briggs.
1939. H. Smith and T. W. Ashby.
1991. J. Chatterton.
2341. F. Levick.
1946. J. M. Hetherington.
1972. G. Collier.
1903. W. Wilson.
1941. A. P. Chamberlain.
2065. H. O. Robinson.
1893. H. Medlock.
1908. J. Fowler, R. Burton, D. Greig, E. E. Allen, and W. Worby.

PATENTS ON WHICH THE SEVENTH YEAR'S STAMP DUTY HAS BEEN PAID.

1747. A. Allan.
1871. G. Collier.
2058. J. C. G. Kennedy.
1841. G. Sanders and R. E. Donovan.
1848. S. Statham and W. Smith.
1867. W. E. Baker.

LIST OF SPECIFICATIONS PUBLISHED

During the Week ending August 16, 1862.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s. d.		s. d.		s. d.		s. d.		s. d		s. d.
38	0 4	67	0 8	74	0 4	82	0 10	89	0 8	97	0 4
61	0 8	68	2 0	75	0 10	83	0 10	90	0 4	98	0 4
62	0 4	69	0 4	76	0 4	84	0 4	92	1 6	99	0 6
63	2 4	70	0 8	77	1 4	85	0 10	93	0 4	...	...
64	0 4	71	0 6	78	0 4	86	0 4	94	0 8	...	...
65	2 0	72	0 4	79	0 4	87	0 4	95	0 4	...	...
66	0 8	73	0 6	81	0 4	88	0 4	96	0 4	...	...

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5*s.* must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Dates of Registration.	Nos. in Register.	Names and Addresses.	Subjects of Design.
June 28,	4491	W. H. Blanch, Liverpool	Rifle foresight.
„ 30,	4492	W. C. Edge, St. John-st. Road, E.C.	Fastening.
July 7,	4493	T. K. Mace, Birmingham	Hat suspender.
„ 12,	4494	C. Weintraud, Jun., Offenbach	Fastening.
„ 17,	4495	H. B. Harris, Birkenhead	Concavoterminal cigar.
„ 19,	4496	W. Orth and Co., Chiswell-street	Bag frame.
„ „	4497	W. Oxley and Co., Manchester	Steam trap.
„ 22,	4498	J. Orchard, Birmingham	Sugar tongs.
Aug. 8,	4499	S. Walker, Jun., Birmingham	Cornice pole.
„ 9,	4500	Herrington and Hale, Clerkenwell	Instrument for finding centres.
„ 11,	4501	S. Phillips, Birmingham	Fastenings.

PROVISIONAL REGISTRATIONS.

June 23,	1358	H. Barratt, Camden-town	Rocker stand.
„ 26,	1359	J. Shrimpton and Son, Studley	Crochet needle
„ 28,	1360	C. Burn, Middle Scotland Yard	Tramrail.
July 4,	1361	J. Kelly, Roscommon ...	Churn.
„ 5,	1362	F. Barker, Hammersmith	Packets.
„ 7,	1363	C. Pullinger, Selsey	Mouse trap.
„ 17,	1364	J. Roberts, Jun., Whitechapel-road	Self alarm treasure box.
„ „	1365	R. Marrison, Norwich...	Muzzle stopper.
„ 18,	1366	S. Needham, Chelsea ...	Match holder.
„ „	1367	A. Le Maignent, Walton-street, S.W.	Coffee pot.
„ 26,	1368	A. Le Maignent, Walton-street, S.W.	Coffee pot.
„ „	1369	A. Le Maignent, Walton-street, S.W.	Water jug.

THE

MECHANICS' MAGAZINE.

LONDON, FRIDAY, AUGUST 29, 1862.

THE INTERNATIONAL EXHIBITION.

Iron and Hardware.

In our various notices of the contents of the International Exhibition, we have endeavoured to do something like justice to those manufacturers and others who have contributed the products of their inventive skill and practical talent, and especially to those who have excelled in the mechanical arts and furnished the best illustrations of applied science. It is impossible, however, for us to traverse the nave, transepts, courts, galleries, and annexes of the spacious but ungainly building, without becoming painfully conscious of the gigantic nature of the task, and of the certainty, after all, of leaving some points of interest untouched. Merely general remarks upon the innumerable items which everywhere present themselves to the eye, and plead eloquently for individual comment, seem but an inadequate return for the extraordinary ability of which those items are the witnesses; and yet particular notice of all is simply an impossibility. To those exhibitors who may feel that at our hands they have not, as yet, received their fair meed of commendation, we can only plead the enormous difficulty of the work, and ask them to have patience.

In the Eastern Transept we are aware that there are materials for articles which would fill our columns, and fill them advantageously to our readers, for many months to come. Unfortunately, however, we are only able at present to deal with some of the most important of those materials. Messrs. Naylor & Vickers, of Sheffield, here exhibit an admirably arranged display—trophy is, somehow, not a palatable word — of the works for which they are celebrated. When we say "admirably" arranged, we speak advisedly, and the adjective is justified by the fact that each specimen of workmanship exhibited by them is so placed that it may be fairly seen and properly examined. Railway wheels, and tyres of cast steel, form the most conspicuous features of the show, and these are exhibited in their several stages of progress from the sand to the finished article. The severe strains to which they have been subjected, with a view to demonstrate the quality of the substance of which they are composed, are obviously apparent; and it is impossible for the practical man, after examining into the results of those testings, to gainsay the evidence of excellence which they adduce. The disc wheels for locomotives appear especially adapted for the purpose for which they are designed; and testimonials from the several railway companies by whom they have been successfully used, are a proof that they not only appear but actually are so. To our thinking, their form is such as to combine lightness and strength—those important desiderata in almost all kinds of machinery, and peculiarly so in locomotive engines.

In cast-steel axles, Messrs. Naylor & Vickers are well represented in the Eastern Transept. These are shown in the rough, after turning, and when bent by the irresistible force of hydraulic pressure. Piston rods are to be found of various sizes, and in one case a locomotive piston and rod in one solid piece. This is an excellent specimen of workmanship; and, with the cast-steel double-crank axles exhibited, is a remarkable proof of the capabilities of the firm to produce elaborate as well as simple articles of the beautiful material, in the treatment of which they excel.

To enumerate the variety of specimens of workmanship in relation to railway economy, would exceed the limits of space at our command; but it would be unfair to omit honourable mention of Messrs. Naylor & Vickers' solid cast-steel reversible railway points or bearings. The name of these conveys a correct idea of the purpose for which they are intended, and it needs but one glance from the eye of a railway engineer to discover their adaptability to that purpose.

Wheels and pinions of cast steel are shown in the rough and after trimming, and they promise to inaugurate a new era in mill-work. Boiler-plates of the same substance, for locomotive and marine engines, and capable, although of extreme lightness, of withstanding high pressures, are to be seen in the display under notice. So far we have confined our observations in reference to the stand of Messrs. Naylor & Vickers to those specimens of their handicraft which relate to the arts of peace. Like many other engineers and manufacturers during the last few years, however, they have been obliged to turn their attention to the formation of implements of destruction; and their exhibition of ordnance of varied kinds and calibre, finished and unfinished, will well repay the inspection of those who desire to be convinced of the universality of application of cast steel. The density and homogeneity of the metal used in the construction of the guns exhibited, promise to offer the maximum of resistance with the minimum of weight. We have no reason to doubt that the samples shown are fairly selected ones; and, if they are so, we must congratulate the firm on the success they have achieved in the direction of ordnance manufacture.

The cast-steel bells of Messrs. Naylor, Vickers, & Co., are so well known, that it becomes a superfluous task to do more than mention them here. All who have gone into the Exhibition must have observed those which grace the Eastern Transept, or have heard their clear and silvery sounds. During the last five years, we are told, no less than three thousand steel bells, varying in size from 7ft. 6in. in diameter down to 12in., have been purchased from the Sheffield works. They have the advantage over bronze bells of costing 40 per cent. less per lb.; and as they are made of far less thickness in proportion to their diameter than bronze, it is easy to comprehend the economy, in all respects, derivable from their use. Large as has been the demand for steel bells, it is probable that the publicity given them in the Exhibition will greatly extend that demand.

Speaking of bells, we turn now to a set also arranged in the Eastern Transept, but of a different material to that employed in the manufacture of those to which we have just referred. These are of bronze, and the work of Messrs. Warner & Sons, of the Crescent, Jewin Street, London; and certainly they loudly and musically testify to the skill of the manufacturers. They are so arranged as that it does not require a knowledge of music in the chimer to make them chime melodiously. A perforated barrel placed beneath the set of bells, and mechanically driven, causes their tongues to move in harmonious unison, and to draw forth the most dulcet sounds. (We gave an illustrated description of this peal of bells in a recent number of the Magazine.) The firm in question, as is well known, have for several years past devoted great attention to the art of bell founding, and recently they have patented a process in connection therewith which has been productive of the best results. The large bell for the Clock Tower of the New Palace at Westminster, and which elicited so much discussion in and out of Parliament, was the work of Messrs. Warner & Sons. It is, indeed, the largest bell in England, and it may not be improper here to give its dimensions, which are as follow:—

	ft.	in.
Diameter at mouth	9	$5\frac{1}{2}$
Height	7	$10\frac{1}{2}$
Thickness of sound bow		$9\frac{5}{8}$

Weight with clapper, 16 tons, 11 cwts., 2 qrs., 20 lbs.

The means and appliances which Messrs. Warner & Sons have at their disposal for the casting of bells may be judged of by the Brobdignagian proportions of the Parliamentary bell. Between this monster and the smallest hand-bell for domestic purposes, the firm named are able to produce every intermediate size. It is not for bells alone that the Messrs. Warner are remarkable in the International Exhibition: their pump "trophy," in Class 8, gives an excellent notion of their performances in respect to hydraulic machinery. It is not too much to say, indeed, that in pumping apparatus they are almost unrivalled. From the most powerful machinery employed in raising and forcing water, down to the smallest hand pump or garden engine, they are equally at home. Were we to attempt to particularise the variety of hydraulic machines which owe their origin to the Messrs. Warner, we should probably trespass as much on the patience of the reader as on our own space. For fire-engines they have made for themselves a name which, when the arrangements for the suppression of fires in the metropolis, which the Government have it in contemplation to make, are completed, will be a great and legitimate recommendation to them. In various parts of the International Exhibition, indeed, Warner's fire engines are to be found. In Class 31 the same firm shine conspicuously in respect of braziery, baths, steam fittings, &c.; whilst for horticultural implements, Class 9 (Taylor's Conservatory) tells a flattering tale of the Messrs. Warner & Sons. For the last-named, indeed, they have received "Honourable Mention" from the jurors, the highest award made in the horticultural branch of the World's great Show. For their chiming machinery, apart from that attached to the bells named, and to be seen in Class 31, Messrs. Warner also have gained a prize medal.

If our notice of this firm be scarcely commensurate in length or fullness with the extensive display they make at Kensington, the fact must be attributed to its true cause—the pressure of other matter upon our columns.

Next week we shall pursue our enquiries in respect to iron and hardware.

AUSTRALIA AT HOME AND AT THE INTERNATIONAL EXHIBITION.

Although many desultory articles have appeared in the public prints of the day, in relation to what may be termed the Australian Section of the International Exhibition, yet it seems to us that but a scant measure of justice has, upon the whole, been dealt out to it. It is this consideration, and the desire we have to communicate to our readers matters of interest and importance, come from whence they may, that induce us to endeavour to repair the shortcomings of the press in its treatment of Australia, and Australian productions. The task is rendered the more easy from the fact that the able Secretary to the Victoria

Commissioners, J. G. Knight, Esq., has furnished us with some admirably-arranged statistical, and other information in relation to the great colony in question. The actual amount of space accorded to, and occupied by, the various divisions of the Australian continent in the Exhibition, is as follows:—

	Superficial feet
Victoria, in four allotments	5,665
New South Wales	2,500
South Australia	1,800
Queensland	1,462
Western Australia	625
Tasmania	1,600
	13,652

We include Tasmania in this table because it is so near a neighbour of the Australias that it would be unfair to treat it as a distinct colony. It will thus be seen that, so far as the floor area occupied by our friends at the Antipodes is concerned, they are fairly accommodated. The awards of medals and of "honourable mention" by the jurors to Australian Exhibitors is in consonance with the space they occupy, and, although we may rest assured that the echoes of bickerings, and of grumblings from the lips of the disappointed, will by-and-by reach us, yet there is little real ground for them. The decisions of the jurors in reference to the provinces named above are in this wise:—

	Medals	Honourable mention
Victoria	111	92
New South Wales	76	50
South Australia	25	18
Queensland	26	20
Western Australia	15	12
Tasmania	38	26
Total	291	218

We need not particularise the objects which the jurors have especially selected for distinction, and, indeed, the space which such a mode of proceeding would demand is a barrier to its being carried out. It may be stated that in both the mineralogical and agricultural departments, the Australian awards have been extensively made, and we infer therefrom that the colonists are not, as some have imagined, so completely absorbed in the pursuit of the wealth which lies below the surface of the earth, as to lose sight of the means of making the surface itself productive.

In the useful and ornamental arts, too, it need not be said that Australia has distinguished itself in the Exhibition, because a visit to the courts of the South Kensington palace will demonstrate the fact most fully. The province of Victoria, in its display of machinery, instruments, implements, and tools, has made itself remarkable in the highest degree, but the unprecedentedly rapid progress of that colony is sufficient, perhaps, to account for the excellence it has attained in these directions. It is questionable whether any parallel in ancient or modern times can be found to the speed with which Victoria has advanced on the high road of civilisation, or developed its material forces. In the year 1836, the census of Port Phillip, since re-christened Victoria, gave the following returns:—Males 142, females 35; total 177. At that time and up to the year 1851, Port Phillip was a province of New South Wales. In 1851, Victoria was separated from the Government of New South Wales, and started as an independent colony, with 77,345 inhabitants. The population of the adjoining and parent colony was at that time 197,168 persons, or 119,823 more than that of Victoria. Since the year 1851, however, the increase of population in the last-named place has been positively astounding, for the census of the Australias in 1861 gave the subjoined return:—

Victoria	540,322
New South Wales	350,860
South Australia	128,000
Queensland	30,051
Western Australia	16,000
Tasmania	89,977
	1,155,210

As may be imagined, the march of improvement has kept pace with that of the population, and from the mass of statistical materials with which Mr. Knight has supplied us, we extract some items, which eloquently prove that this is so. Under the heading of "Public Improvements," we find that since the year 1851, the under-mentioned sums have been expended in the colony of Victoria:—

	£
Public Works, exclusive of Railways	4,211,753
Public Roads and Bridges	5,272,620
Government Railways to Geelong, Ballarat, and the River Murray, in all 219 miles	828,233
Suburban Railways undertaken by private companies	1,154,505
Electric Telegraphs, 1,504 miles	163,000

Figures like these speak more convincingly of prosperity and advancement than whole columns of writing could possibly do. No doubt the mineral products of the colony are in all respects at the *base* of this extraordinary onflow of progress, and they really account for it. The quantity of gold exported from Victoria between October 1, 1851, and October 1, 1861, amounted to 26,163,432 ounces troy, equal to 800 tons 17cwt. 3qrs. 7lbs., or in value, 104,649,728*l.* sterling. The pyramid which stands beneath the Eastern Dome of the International Exhibition, and attracts the notice of all who enter the building at that point, was designed by Mr. Knight to show the comparatively small space which, from its density, so large a quantity of gold would occupy. The actual measurement of the figure is only 1,492¼ cubic feet, yet the value it represents is equal to one-eighth of the national debt of Great Britain.

It may be stated, that since the pyramid was designed, and up to the last accounts, the gold fields of Victoria have yielded a further quantity of 35 tons 2 qrs. 6 lbs., the value of which is 4,642,238*l.* Models of the principal "nuggets," or lumps of gold, found in the colony, are shown in low relief on the base of the pyramid. The exact height of the structure is 44 feet 9¼ inches, and it is 10 feet square at the base.

We have been thus particular in reference to the colony of Victoria and its productions, because it is well that those who go to the Exhibition should have their minds stored with such facts. They are thus in a better condition to appreciate what they see, and to account for its existence. In future remarks which we shall have to make upon the Australian divisions of the International Exhibition, we shall endeavour to do justice to the other great colonies, which are no insignificant competitors with that upon which we have now more especially dwelt. The area of Victoria is 86,831 square miles, or 55,571,840 acres, which is about the same as that of England, Scotland, and Wales united. The number of periodical publications printed and circulating there is 100, and specimen copies of nearly all are to be found in the Exhibition. In Melbourne alone there are published, of newspapers and magazines, three daily, thirty-three weekly, ten fortnightly, ten monthly, one quarterly, and one yearly. A striking proof of the extraordinary progress of Victoria is given in the following extract from a volume published at Ballarat:—"When the Great "Exhibition of 1851 was opened, the only "habitation on the site of the present town of "Ballarat was a shepherd's hut, built of slabs "of wood, and roofed with bark. In a circle, "having Ballarat as a centre, with a radius of "forty miles, the population then did not exceed 500 persons, and consisted of a few "sheep-farmers and their dependants. The "population of the same area when taken "in 1861 was 105,996 persons. At the present time, there are published in Ballarat "four bi-weekly, one weekly, and two daily "papers." Such is the gourd-like growth of Australian provinces and towns. The interior explorations of Australia will presently lead to a wide extension of that growth and developement, and who shall say when it will reach maturity?

CRINOLINE.

Although the title of this article may startle somewhat the readers of the Mechanics' Magazine, yet is there much in relation to the material which is of interest to them. For several years past many hundreds of workmen have been employed in its production, and every week hundreds of miles of crinoline are manufactured in Sheffield. The demand for the article appears, indeed, to increase rather than diminish, and wherever civilisation exerts its influence, the fashion of wearing it has extended. It is not alone, however, in the direct conversion of iron into the narrow ribands of steel which constitute crinoline, that an impetus has been given to trade. The brass and iron wire makers and workers of the kingdom have derived largely-increased employment through the predominance of the fashionable weakness. The quantity of wire used in the manufacture of fire-guards for the prevention of those accidents from the use of crinoline, which, nevertheless, are of too frequent occurrence, is immense. In fact, we believe that the weight of iron and brass consumed in the making of fire-guards is far greater than the weight of crinoline, which Sheffield and other seats of its manufacture produce. Of course a corresponding amount of activity has resulted to the makers of wire-drawing machinery, and of rolls and other apparatus for the manufacture of crinoline. We say nothing of the effect that both branches of trade have had upon ironmasters, and agents connected with them, because it is palpable that that effect must have been most beneficially felt. Who shall say, then, that crinoline is too trivial a subject to be entertained in the Mechanics' Magazine?

It is not our province, we admit, to discuss the wisdom of wearing the gossamer-like and expansive material, although, in our professional visits to the International Exhibition on crowded days, the question has pressed itself upon us with considerable force. There is, nevertheless, a point of view from which we may legitimately look at crinoline; and it is that of its influence as an industrial product upon the well-being of our artizans and work-people generally. It is to the Empress Eugenie, of France, that the classes of manufacturers and their employés to whom allusion has been made, are indebted for their new and extensive occupation. That illustrious lady appears, indeed, to be as potent in the realms of Fashion as was Diana of the Ephesians; and she has the advantage over that ancient potentate of having the command of inexhaustible scientific appliances for the realisation of her edicts. The taste of the Empress is the oracle, and her boudoir the

temple, whence issue laws which, unlike those stupid ones of the Medes and Persians, are perpetually undergoing mutation. Great as is the power of her Imperial husband, hers is a still wider dominion—he only rules France, while she holds in leading-strings of mauve or magenta dye the entire female world! He is said to have imposed fetters on his subjects, but she envelopes hers in hoops of steel. Napoleon exhibits his autocratic will in reference to shades of opinion; that of the lady is as arbitrary and potent over the hues of ribbon. We dare say that the extraordinary prevalence of a particular fashion was never more widely illustrated, in every sense, than in the current wearing of crinoline. It has outrun the march of the missionaries. Even the female members of the wild Caffre tribes have been bitten by the passion for a circumference of skirts; and in their case, perhaps, the innovation may be regarded as an improvement. Where the alternative lies between no skirt at all, and too much of it, we cannot hesitate in giving a decided preference to the latter extreme.

Still, when this overbearing Parisian mode shall come to be adopted in the region of the Hottentots, it will not be deniable that the fashion has reached its climax of superfluity. We venture to believe that an "idea" and obedience to it were never more rapidly extended over the globe. The idea of diffusing the female dress is now shown to be the truly diffusive one, and hence workers of iron and steel occupy the strange position of supplementing the exertions of the milliner.

The ladies are imitative beings, and when the Empress first diminished her bonnet, and then moved it off her head altogether, they, one and many, did so too. What she did in the matter of petticoats was immediately adopted wherever that garment, which Byron reverently called "a mystical sublimity," was worn or obtainable. What the next movement of the fair monarch of the world of Fashion may be we know not, but it is certain that it cannot be more universally copied than has been that of wearing crinoline.

A RETROSPECT OF ENGINEERING AND ARCHITECTURE.*

These are the days of steam and electricity. The post is too slow for us, and the stopping train is voted a bore. We live in a perpetual whirl. Onward is the watchword. Now the wisdom of all this is very questionable. *Festina lente.* It is not the "crib" at school or the "cram" at college that makes scholars. The hurried meal impairs digestion and defeats the very end for which it is taken. The man who makes every journey at express speed is not necessarily a great traveller—that is measuring a traveller by what he sees and what he is able to describe. It may be more convenient to be whirled to York in four hours, but the old traveller who took six times as long to perform the distance could give a far more interesting account of the journey—its hills and valleys, its rivers and streams, it woods and meadows, its fens and moors, the quaint old inns, the stately mansions, the deserted ruins; how, as he rambled along, milestone after milestone was carefully noted—how, when the hill was climbed and the horses were taking wind on the summit, the eye wandered over the delightful prospect, the valley behind, the vast plain stretching out before—how town after town and village after village were entered and passed, marking at each succeeding stage the progress towards the journey's end.

It is just in this way that certain annual publications mark the progress of the age in literature, in science, and in art, and such books, when compiled by men who are authorities on the subjects of which they treat, are not only welcome but peculiarly valuable. We are glad, therefore, to find so learned and scientific an authority as Mr. Burnell, recording for the benefit of readers, both professional and non-professional, such an amount of information as he has brought together in the first volume of the "Annual Retrospect of Engineering and "Architecture." The range of subjects is extended, embracing in five divisions almost everything of importance that was either a matter of speculation or became a recognised fact in the engineering and architectural world during the past year. Thus we are treated to articles on Metropolitan Railways and Streets, Street Tramways, Railway Accidents, the Broad and Narrow Gauge Question, the Thames Embankment, the Waters of the London Docks, Steam on Canals, Petroleum Oils, the Mont Cenis Tunnel, a comparison between the Street Architecture of London and Paris, the Preservation of Stone, Coast Defences, the Fleet of the Future, Coles's Cupola Ships, the Strength of Iron Ships. Be it remembered this is by no means a complete list of the subjects treated of in this volume, and it is only just to the editor to say that his articles are not mere compilations or dry records, but are entirely recast in the mould of his own well-stored mind, and exhibit a depth of thought and an originality of treatment not often to be met with in books of much loftier pretensions than a "retrospect" can possibly make.

On the subject of railway accidents, Mr. Burnell writes: "In the winter of 1860-1 many "accidents occurred on the English railways, "*from the great changes produced in the mole-*" *cular structure of the iron used in the working*" *parts of the engines and carriages, especially*" *in the tyres, axles, connecting rods in the rails,*" *chains, points, and crossings,*" &c. Now our author assumes here, what will be seen from our review of Mr. Kirkaldy's work on experiments in wrought iron and steel, is still an open question, the only proof, or rather assumption of proof, that the "molecular struc-"ture" of the iron becomes changed in use, is in the fact that the fracture is crystalline, whereas the iron is, or should be, fibrous; but this crystalline appearance Mr. Kirkaldy's experiment clearly shows is due, not to the molecular structure, but the *suddenness* of the fracture, which is especially the case in railway accidents. Our author's suggestion of a possibly efficient remedy for railway accidents is, we think, worthy of close attention. "A passenger," he says, "who takes a seat in a railway carriage, "becomes at once a helpless being, at the mercy "of an engine-driver and stoker, of some guards "and watchmen, all of whom are usually "ignorant, uneducated men, utterly unfit to be "intrusted with the fearful power over the "lives and limbs of the hundreds committed "to their charge. It may be laid down as a "law, that no unforeseen accident can happen "to the roadway and rolling stock, if proper "attention be paid to it. On a well-managed "line of railroad, no collisions, no runnings "of one train into another, could occur. The "questions really to be solved for the pre-"vention of railway accidents are, how to "organise the most efficient superintendence "of the road and of the plant, and how to insure "the regularity of the arrivals and departures "of the trains, so as to avoid collisions? From "practical experience of railway working, and "from long and anxious consideration of all "the circumstances connected with it, we are "sure that one of the most efficient solutions "of the question is to be found in the concen-"tration of the administrative power of those "establishments in the hands of one person, "and in rendering him personally and pecu-"niarily responsible for the neglect of duty "by his subordinates, selected by himself, and "acting exclusively under his orders."

It appears from Mr. Burnell there is still hope for canal property. We had almost thought the canal system was drowned, beyond the resuscitative powers of all the Humane Society staff. It appears, however, after all, only to be a case of suspended animation. Rectify and improve the water-courses themselves, and then, as our ingenious neighbours across the Channel borrowed the idea of a canal steam-system from Mr. Rendels' ferry boats over the Hamoaze and the Itchen, let us take a trip to Paris, stroll along the banks of the Seine as far as Rouen, and observe on our route the very curious plan of steam traction in operation. Mr. Burnell says:—"Perhaps the most striking application of "steam power to water transport is the one "lately made upon the Seine, in both its "upper and lower reaches, and now in course "of application to some of the artificial lines "of water-communication of France. In this "case the first step was to establish between "Paris and Rouen, following all the windings "and the locks of the Seine, a strong chain "cable lying loose upon the axis of the na-"vigable channel. Steam tug-boats are pro-"vided, carrying engines of 150 or 200 horse-"power, working at high pressure, upon "the same principle as the locomotive engine. "The boats bear fore and aft guide pulleys, "susceptible of being moved by the same "machinery as the rudder, which take up the "slack of the cable and lead it to a drum wheel, "round which it passes a sufficient number of "times to produce an efficient resistance to "the action of the engine, and thus to propel "the boat without either wheels or screw "working on the water. The barges to be "towed follow at a small distance behind, or "they are occasionally lashed to the sides of "the steam-tugs, and in this manner trains of "6, 8, or 10 barges of 240 tons each descend "the Seine at the rate of six miles per hour, "or remount it at the rate of four miles an "hour, at prices per haulage considerably "lower than those formerly paid for horse "traction. It is something of this description "which is required for our artificial canals, "modified, no doubt, for the passage of small "tunnels, unfit to receive engines blowing off "large volumes of steam and smoke, and for "the canals having soft muddy bottoms; but "as the cost of establishing such a system "must be considerably less in England than "in France, it would be very desirable to "attempt its application here."

It was said of Augustus that he found Rome of brick, and left it of marble. Perhaps Napoleon III., who has avowedly made the first Cæsar his study, is also ambitious to vie with the second and greatest of all the Cæsars. Certain it is, that if a proscribed legitimist, who had not visited the capital since the fall of the Bourbon, or an Orleanist refugee who may have accompanied Louis Philippe in his flight in 1848 and had not since returned, were now to visit Paris, he would find it indeed changed. Whatever the motive, whether policy, or vanity or philanthropy, the present Emperor has endeavoured to make his capital not only the gayest

* The Annual Retrospect of Engineering and Architecture: a Record of Progress in the Sciences of Civil, Military, and Naval Construction. Vol. I. By George R. Burnell, C.E., F.G.S., F.S.A. Lockwood & Co., 1862.

but the grandest in Europe. This has been done at an enormous cost; for, according to M. F. de Lasteyrie, quoted by the author of the Retrospect, "the indemnities paid or to "be paid by the city of Paris for the expro- "priation of the houses recently demolished, "has amounted to the enormous sum of "12,840,000*l*. since 1852, and the amount was "still far from being closed." Now, what is the effect of all this? Why, our author tells us that, whilst much requires to be done to render London as convenient as it might be made, it nevertheless contrasts favourably with Paris. "There is," he says, "perhaps a want "of unity of direction, and of grandeur of "conception, in the works of improvement "lately executed in London; but a careful "comparison of those built here for domestic "purposes with those erected in Paris will "prove that the rule of tempered liberty is "far more favourable for art than is the most "perfect system of governmental organisa- "tion. There is greater vigour, more thought, "originality, and truth in the buildings lately "erected in Cannon Street, Fenchurch Street, "Cornhill, Leadenhall Street, than can be "found in any new part of Paris; and even "the builders' architecture of South Kensing- "ton and of Tyburnia, detestable though it "be, is bolder, freer, and of a purer taste than "the meretricious architecture of the new "Boulevards of Paris." Our author complains that "the houses in the new streets of "the French metropolis are drilled to the "same degree of uniformity as a regiment of "soldiers would be; whilst all originality, all "the quaint picturesqueness of outline which "was observable in old Paris, have disappeared "under the influence of the modern notion of "equality. The long vistas of the streets, "stretching away until their sides almost "seem to meet at the vanishing point, singu- "larly contribute to this effect of monotony; "and as the new streets have no historical "recollections connected with them, they are "in every respect dull, stale, flat, and unpro- "fitable. The taste of the architectural de- "tails in the elevations is also as questionable "as their general effect; for the 'bed-post "and valance' style of ornamentation, the "unmeaning introduction of shallow paneling, "and the ineffective profiling of the mouldings "in accordance with the taste brought into "vogue by M. Duban, of the Ecole des Beaux "Arts, have been exaggerated in the new "streets." In another article elaborately written on the water supply of Paris, London stands in more than favourable contrast. Parisians may turn up their nose at our dirty Thames, and talk of their pellucid Seine; but what becomes of the daily accumulation of filth in a city containing a million and a half of people, to whom a daily supply of four gallons of water per head is accounted liberal, and by whom so much is not consumed? It will be a blessing for London when its noble river is freed from its pollution; but we should not like its waters rendered limpid at the expense of our three millions being compelled to live à la mode Parisienne.

We commend Mr. Burnell's book to the careful perusal of all interested in the subjects of which it treats; and although, to use a favourite word of the author's, it is to some extent an "anachronism," its articles have a more than temporary interest; and, as an amend for the delay in the appearance of this first volume of the "Retrospect," we are promised that each succeeding volume shall be brought out as early as possible, after the close of the year to which it refers.

EXPERIMENTS ON WROUGHT IRON AND STEEL.*

The work before us is a most important contribution to the literature of science, and should find a place among the works for every-day consultation in the libraries of all scientific men, and particularly, of all in the least degree connected with the manufacture or employment of wrought iron and steel. To quote from the title-page, it shows the results of an experimental enquiry into the comparative tensile strength, and other properties of various kinds of wrought iron and steel. The writer and experimenter is an authority on the subject, and his experiments, extending over a period of nearly three years and a half, appear to have been made with the utmost care and with a simple desire to elicit truth.

In the eighth section of the work the author shows, by numerous quotations, the unsatisfactory character of the knowledge possessed of the tensile strength of wrought iron and steel prior to his experiments. Among others, the following from a paper by Mr. S. Hughes, which appeared in a scientific paper in 1858, will show the necessity for the enquiries which the author has so patiently and perseveringly conducted. "There is, probably, no "branch of experimental enquiry in which "more varying and discordant results have "been attained than in that which seeks to "determine the absolute strength of wrought "iron subjected to a tensile strain, or to the "action of a weight applied to tear it "asunder.

"Writers on the strength of materials in "the last century seldom assigned to bar iron "a less tensile strength than thirty tons per "square inch as the weight which would tear "asunder a bar of ordinary wrought iron one "inch square. Thus Emerson gives the ten- "sile strength of bar iron at 34 tons, Selford "29·29, Drewry 27 tons; while at the present "day Templeton gives 25 tons, Beardmore "26·8, Brown 25, and Eaton Hodgkin- "son, probably from more careful experi- "ments than any other, 23·817. The iron "manufacture of this country has attained an "enormous development, which, unfortu- "nately, has not been accompanied by a cor- "responding increase of quality. On the "contrary, all the earlier experiments on iron "found a greater strength than is now pos- "sessed even by the best qualities. It is "foreign to the purpose of this article to give "the causes of this falling-off and deterio- "ration of a national manufacture, otherwise "it would be very easy to show a case of "serious national importance, which is, per- "haps, more worthy of the attention of our "legislators than those to which their labours "are commonly applied. Whatever be the "causes — whether the spirit of speculation, "the race of competition between the great "iron manufacturers to produce their iron at the "cheapest rate, or the introduction of new and "cunning chemical secrets to enable them to "work up inferior iron—certain it is that "our manufacture of wrought iron has been "seriously deteriorating during the last half "century; and unless some improvement "shortly take place, we shall, before long, "acquire a reputation for manufacturing only "inferior iron."

Shortly after the publication of Mr. Hughes's statements, our author's experiments commenced, and, after a protracted and laboured investigation, he comes to the conclusion that there "is not any satisfactory evidence to "show that the iron now produced is inferior "to that made during the last century."

One very important feature in the experiments made by Mr. Kirkaldy is, that he has not only noted down the ultimate strength or breaking weight per square inch of the original area of each specimen, but "the *contraction* "of the area when subjected to considerable "strain, and the still greater contraction at "the point of rupture which takes place in a "greater or less degree as the material is soft "or hard, and the consequent influence this "reduction must have on the amount of weight "sustained by the specimen before breaking. "The apparent mystery of a very inferior "description of iron suspending, under a steady "load, fully a third more than a very superior "kind, vanishes at once when we find that the "former had the benefit of retaining to the "last its original area only slightly decreased; "whilst the latter, on breaking, was reduced "to very nearly a fourth of its original area— "the one a hard and brittle iron, liable to "snap suddenly under a jerk or blow, the "other very soft and tough, impossible to "break otherwise than by tearing slowly "asunder."

Up to the period of making these experiments, it was deemed sufficient simply to ascertain and compare the breaking strains of various kinds of iron: hence, in the official enquiry into the loss of the "Royal Charter," the five plates recovered from the wreck were pronounced good, simply because, upon being tested, their mean breaking strain was 20·55 tons (46,032 lbs.) per square inch, instead of 19·56 tons (43·814), the average for Staffordshire plates. This obviously could afford no proof of the quality of the iron for shipbuilding purposes, as the high breaking strain might have been due to great hardness and brittleness, which would refuse to bend or twist, but snap at once under circumstances in which other iron would not have broken.

The material operated upon was rolled iron, hammered iron, and steel. With respect to rolled iron, the following conclusions have been arrived at:—1. That the quality of the iron improved as the diameter of the bar became less, but that this improvement was most marked in the inferior kinds. 2. That the generally received opinion, that the removal of the "skin" greatly reduced the relative strength, or that a *rough* bar is much stronger than one *turned* to the same diameter, is erroneous. 3. That *forging* affects the comparative strength of iron by rendering it harder, as evidenced by the diminished contracting power of the area. Referring to hammered iron, the author, after freely quoting from Mr. Clay, of the Mersey Iron and Steel Works, whom he pronounces to be "the highest "authority on the subject of forging large "masses," calls attention "to the important "difference between the 'scrap iron' used at "the forge in the formation of large masses, "and that designated 'best scrap' by the "iron master, as he believes that the "difference of opinion regarding scrap "iron is due, in a great measure, to the "want of this distinction. The former is "made up of old miscellaneous pieces collected "from every quarter, the latter composed of "new iron made in the same works, cut up "and worked over again; consequently, the "heterogeneous character of the one is totally "unlike the homogeneousness of the other." This, the writer contends, is a distinction that has been hitherto overlooked, and doubtless the records of his experiments upon specimens of both kinds of scrap, and the beautifully executed drawings of the fractures presented by each kind,

* Experiments on Wrought Iron and Steel. By David Kirkaldy. Bell & Bain, Glasgow. 1862.

will be closely studied by all interested in the forging of large masses. Of the necessity for including steel in the experiments, the author furnishes ample proof, and successfully combats objections made to his tabulated results. The author is certainly correct when he says "he has always considered that (steel) the "best only which best answers its particular "purpose;" and surely a knowledge of the tensile power of steel must aid the consumer in the choice of that which is best suited to his branch of manufacture.

Sections 10 and 11, on the appearance of fracture in Iron and Steel, will be read with great interest. They contain a summary of the long and important discussion, as to whether fibrous iron becomes changed to crystalline during its use. Our author shows clearly that in all sudden breakages the fractures must necessarily present a crystalline and not a fibrous appearance. He does not say that some of the causes assigned for the change from a fibrous to a crystalline condition may not have operated prejudicially on the *tenacity* or *cohesion* of the iron, and so facilitated the rupture, but that the appearance produced by the sudden rupture is no proof that a molecular change during use has taken place from the fibrous to the crystalline condition. The value of a work like the one before us depends upon several conditions. It is important that the author shall bring to his task a due amount of ability—that he shall be *practically qualified* for his work — that his experiments shall be made with the honest determination of arriving at the truth without fear of offending existing prejudices or coming into collision with supposed vested interests—that the subjects of his experiments shall be sufficiently numerous, and the results corroborated by repeated trials—that the tests themselves shall be simple and familiarly described, so that the qualities of the tests may if needful be tested, and the results verified. Now we believe the author has fulfilled all these conditions. He was many years practically employed by the well-known and highly-respected firm of Messrs. Napier & Sons, the eminent engineers, and, to use his own words, has endeavoured, "throughout "the whole of this investigation, to pursue it "with candour and impartiality, and to present "to those interested in such matters a plain "statement of the facts elicited." "I have," he says, "striven to avoid drawing anything like "unjustifiable inferences or deductions, and have "confined myself strictly to such conclusions "as I believe to be fully warranted by the ex-"periments. The data on which these are "based being all minutely stated, it will be in "the power of everyone to judge for himself "of their correctness." Of the variety of specimens the tables will themselves speak, and the mode of their collection was unexceptionable; the testing apparatus is simple, is fully described and illustrated; and we cordially commend the work as a valuable acquisition to one of the most important, if not *the* most important, of English manufactures.

THEORETICAL FORMULÆ FOR THE MOVEMENT OF AIR IN CONDUIT-PIPES.

By Gen. A. Morin,

Academy of Sciences of Paris.*

In the work upon the Steam Engine which I had the honour to present to the Academy of Sciences in 1843, I had, among other questions, treated of the movement of steam from its issuing from the boiler until its entry into the cylinder. The application of the principle of living-forces and of the rules admitted to estimate the influence of the various circumstances which the circulation of this fluid presents, to a steam engine established in the shops of the *Messageries Royale*, had, moreover, shown me that the results of experiment were as conformable to those of theory as one could hope for in such investigations.

As I have been induced for some time past to occupy myself with questions which are connected with the movement of elastic fluids, and especially with that of air in ventilation apparatus, I thought that whilst it was indispensable to consult experiment, it was also necessary to ask of Science, rules which might guide us in the establishment of the apparatus. I was thus led to seek for the means of establishing the formulæ for the movement of air, applying to it the principle of living-forces or of the transmission of work, according to the rules indicated by Borda, and developed by M. Poncelet in his lectures at the School at Metz.

In this work, of which I propose to give to the Acadamy an analysis as succinct as possible, I begin by establishing the equation of the transmission of work, taking into consideration all the losses of living-force which can be produced in the air-conduits, and of the work consumed by the passive resistances.

This question has also been treated, partially at least, by a distinguished physicist, whose still recent loss Science regrets; but, beside the fact that he did not complete the solution, he committed errors in the mechanical part of the question which it is important to rectify.

In the movement of the air through the pipes of the apparatus for warming and ventilation, where recourse has not been had to machines, the motive force is due only to the difference of the pressures, densities, or temperatures, and after finding the expression for them we must equate it to all the losses of living-forces which may be produced added to the work consumed by the resistance of the walls.

The losses of living-force are or may be very numerous, but we have rules for calculating them. It will be sufficient if I enumerate them. They are produced —

1. At the entrance of the pipe in consequence of the contraction there, which is scarcely ever avoided. The expression is (as is known) of the form $M\left(\frac{1}{m}-1\right)^2 U^2$; M being the mass of air passing in 1 sec.; U the mean velocity in the pipe; m the co-efficient of contraction at the mouth.*

2. At leaving the chimney or pipe, the air possesses a living-force which is not utilised, and which is greater in proportion as the orifice is more contracted.

3. When the orifice of entry of the air into the pipe has a section notably smaller than that of the pipe, the loss of living-force after passing this orifice may be very great. This happens especially when the air has to pass through a grate loaded with fuel.

4. Every bend also produces a loss of force, and when there are several the loss may be sensible.

5. The meeting of two currents often produces an analogous effect.

6. Every enlargement of a pipe has also an influence of the same kind.

7. As to the resistance of the walls, we know how to express the work which it absorbs; but up to this time the constant co-efficient which enters into this expression has only been determined by the experiments of Girard and of d'Aubuisson, made on pipes of polished sheet iron, and a valve has been admitted for this co-efficient $\beta = 0{\cdot}0031$.

The experiments of the late M. Darcy on the movement of water in conduit-pipes having shown that the presence of the slightest deposits, such as would diminish the polish of the surface, might triple the value of the analogous co-efficient in water, it is natural to think that the wrinkled surface of pipes of masonry (such as the air flows through in such apparatus), such as are now in question, may have an analogous influence. This is also sufficiently shown by the experiments of M. Peclet.

Taking into consideration all the circumstances of the movement of air, we find for the expression for the volume of air at the temperature of the chimney, which is discharged in one second, by a pipe or by a chimney, under the sole action of the difference of densities, a formula of the *form given at foot of this page.*

Where	Q represents	the volume of air which escapes in 1 second; in cubic mètres.
"	A	the mean section of the chimney.
"	U	the mean velocity in that section.
"	D and T	the density and temperature of the external air.
"	d and t	the density and temperature of the air in the chimney.
"	a	0·003665 the co-efficient of dilatation of air.
"	m	the co-efficient of contraction at the entrance of the chimney.
"	A_1 and m_1	the area and co-efficient of contraction for the exit from the chimney.
"	A′ and m'	the area and co-efficient of contraction for an orifice of entrance differing from the section of the chimney.
"	m''	0·65 a co-efficient of contraction for an elbow.
"	O	the area of a passage greater than that of the chimney.
"	S and L	the perimeter and length of the pipe whose section is A.
"	β	the co-efficient of friction of the air against the walls.

Many of the terms in this formula may be repeated a number of times, others may not exist; according to the arrangement of the pipes.

In seeking to appreciate the influence of the various terms which enter into this expression, we recognise at once, as was evident *à priori*, that the volume of air Q, at the temperature of the chimney, which can pass through the pipe, is nearly directly proportional to its transverse section, and as we may almost always control this section, there results a great facility for obtaining such results as we may desire.

As to the numerator of the fraction which is under the radical, it shows that the velocity in a pipe increases only with its square root, and consequently less rapidly in proportion as it is greater.

This numerator having for its value

$$2\,g\left(\frac{D-d}{d}\right)H = 2\,g\,a\,\frac{(t-T)\,H}{1+a\,T}$$

it is seen at once that it increases: 1st, proportionally to the square root of the height of the chimney (or orifice of discharge) above the entrance opening, which was known before; 2nd, proportionally to the factor $\frac{t-T}{1+a\,T}$, and that the height H of the chimney being once determined, if we wish to make the velocity of the air nearly constant, this factor must have the same value, whatever be the external temperature T.

In the applications to ventilation where the temperatures of the external air are most

* This is the proper place to remark that Mr. Peclet, in the formula given in his 3rd edition, p. 114, supposes that this loss is expressed by $M.\ \frac{1}{m^2}\,V^2$, which leads to a serious error, and is reproduced in the most of his other formulæ.

$$Q = AU = A\sqrt{\frac{2g\left(\frac{D-d}{d}\right)H \text{ or } 2ga\frac{(t-T)\,H}{1+a\,T}}{\left(\frac{A}{m'_1}\right)^2+\left(\frac{1}{m}-1\right)^2+\left(\frac{A}{m'A'}-1\right)^2+\left(\frac{1}{m''}-1\right)^2+\left(1-\frac{A}{O}\right)^2+\frac{2SL\beta}{A}}}$$

* Translated for the Journal of the Franklin Institute, U.S.

frequently such that the term $1 + a\,T$ differs little from unity,* it will be seen that we may always secure the same velocity and consequently the discharge of the same volume of air at the temperature of the chimney, by maintaining the excess of the temperature of the chimney over that of the external air, constant.

Whence results this practical rule, very simple, but only true within certain limits: "To obtain in a given and established system of ventilation by draft the discharge of the same volume of external air, whatever may be the variations of the external temperature, it is necessary and it is sufficient to regulate the working of the heating apparatus, so that the excess of the temperature of the air in the chimney over that of the external air may be constant."

This rule is in accordance with a great number of experiments.

As to the denominator, all whose terms are positive, it may in certain arrangements of the pipes acquire a value sufficient to diminish materially the velocity of discharge.

By introducing into it numerical values, and by supposing between the sections of the passages ratios which are frequently met with in practice, I have shown that in quite common circumstances the velocity of discharge may be reduced to 1-4th of the value which it would have if these causes of loss were suppressed, and that often it does not exceed 1-10th of this value.

I have just said that the practical rule which I announced was only true within certain limits: in fact, the volume of air discharged by the chimneys to which it applies, is not that which it is important to render constant in ventilating apparatus. This volume is that of the warm air which is discharged by the chimney, while the volume of air which assures the ventilation of inhabited buildings is that which is introduced to replace the vitiated air discharged.

Now, it is easy to see that this latter volume, which is at a temperature T lower than that of the chimney t, is less than the first in the ratio, $\frac{1 + a\,T}{1 + a\,t}$, whence it results that its expression is

$$Q' = A\sqrt{\frac{1 + a\,T}{K}}\,\sqrt{2\,g\,a\,H}\,\sqrt{\frac{t - T}{(1 + a\,t)^2}}$$

and that it is susceptible of a maximum corresponding to the value $t = \frac{1 + 2\,a\,T}{a}$,

which maximum is $Q' = \frac{A}{K}\sqrt{\frac{g\,H}{2}}$,

K representing the radical which forms the denominator of the preceding equation for the value Q of the air at the temperature t.

This maximum value for the effect of a chimney has this remarkable about it, that its value is absolute and completely independent of the disposition and arrangement of the apparatus: if the temperature of the external air is 0° Cent. this value is 272°; if $T = 10°$, $t = 282°$; and these values are nearly those of the mean temperatures which are established in the chimneys of well-constructed steam engines.

Influence of the Section of the Chimney on the Economy of Fuel.—The size of the transverse section of the chimney has not only a favourable influence on the velocity of discharge, but it also has a much more direct and preponderant one on the volume of the air discharged, and this has a notable influence on the economy.

In fact, as the volume of air evacuated from the rooms to be ventilated increases only with the square root of the factor $\frac{t - T}{(1 + a\,t)^2}$, whilst it increases in proportion to the mean transverse section of the chimney, it is easy to see that whilst an increase of temperature from 20° to 80° augments the volume of air at 10° drawn in only as 1 to 2·19, we should obtain nearly the same increase by doubling the section of the chimney. But this last method would be only an expense to be submitted to once; whilst the increase of the temperature of the air from 10° to 20° and from 10° to 80°, would increase the expenditure of fuel in the ratio of 10 to 70, whilst the effect of ventilation would increase only as 1 to 2·19.

There is therefore a great advantage in employing chimneys of large section and moderate temperatures to obtain the effects of ventilation by draft.

It must, however, be remembered, that the stability of the ventilation requires that the velocity in the chimneys of discharge shall not be less than 2 m. or 2·5 m.

Application of the Theoretical Formulæ to different cases; and comparison of their results with those of observation.—After having explained the rules to which theory leads, passing to the application of the general considerations to several peculiar cases, I examine in the first place that of a straight chimney under ordinary conditions, and I come directly for this simple case to the following formula:—

$$U = 0{\cdot}9544\sqrt{\frac{D\,H\,(t - T)}{L + 16{\cdot}11\,D}},^{*}$$

which expresses the mean velocity in the vertical pipe of a chimney in functions of its dimensions and of the difference of the interior and exterior temperatures.

Now in seeking to modify, by the discussion of a great number of observations, a formula given by M. Peclet in the first edition of his *Traité de la Chaleur*, the inaccuracy of which this physicist had since recognised, a skilful practical man, M. Guerin, engineer for the house L. Duvoir-Leblanc, reached the following rule:—

$$U = \sqrt{\frac{D\,H\,(t - T)}{L + 16\,D}};$$

which is, so to speak, identical with that to which the principle of living-forces leads.

Comparison of the different arrangements employed to produce the draft of the vitiated air.—Among the different means of determining the movement of the air in draft-chimneys, there are two which have been applied in many large establishments, sanitary and others.

In the one, the furnace which excites the draft is established in the upper part of the building; this has received, with more or less correctness, the name of *draft from above.*

In the other, the furnace is established in the cellar of the building, and all the vitiated air to be extracted is brought there by descending pipes: it may be called *draft from below.*

Between these extremes there was a third which it was desirable to study, and which consists in placing the furnace on the same level with the air to be extracted; this, in imitation of the names which we have mentioned, may be called *draft from the level.* This system has been employed in the Polytechnic School, and has just been introduced into the offices of the Northern Railroad.

By applying to these three systems the considerations which we have mentioned, and supposing them of equal proportions in all other respects, we are able to calculate the velocities of the discharge of the air from the different stories of the same building; and, according to the data which we have admitted for the three cases, we have been able to form the following table, which permits the appreciation of the effect of these three systems:—

	Velocity of the discharge of the air		
	Draft from below	Draft from the level	Draft from above
Basement .	2·593 mètres	2·684 mètres	2·251 mètres
First storey .	2·508 „	2·450 „	2·144 „
Second storey	2·431 „	2·119 „	1·994 „

This table shows that, of the three systems of draft indicated, according to the hypotheses, and with the same numerical data nearly approximating to the circumstances which may present themselves in practice, that in which the air drawn out is heated on the level of each storey, will cause, for the same expenditure of heat, a rather greater velocity for the basement, about the same for the first storey, and a little less for the second storey, than that in which the draft is produced from below. As to the system in which the furnace is placed above the stories to be ventilated, it will cause, as was to be expected, velocities in all the cases rather less than the other two systems.

The system of *draft from the level* appears, therefore, to be the most advantageous of the three: its superiority and that of the draft from below over that of the draft from above is to be entirely attributed to the fact that in the two first systems, the heights of the discharge chimneys permit more advantage to be taken of the specific levity given to the air; but it must not be forgotten that, as the walls of the chimney cool the air which passes through them, the velocity may thus be diminished, and the advantage of this arrangement somewhat reduced.

However this may be, it appears to me to result from this discussion that the system of draft from the level ought to be preferred to the two other systems: its introduction presents no difficulties of construction, and, according to the examination of the proposals for the offices of the Northern Railroad, it appears to be both more economical in cost of construction and of daily expenditure: the great height of the chimneys must also give great stability to the effects.

(To be concluded in our next.)

* It is necessary to notice here a fault of considerable gravity in the formula of M. Peclet. This physicist, in his 3rd edition, vol. ii. p. 37, introduced into the numerator the factor $\frac{t - T}{1 + a\,t}$ in place of $\frac{t - T}{1 + a\,T}$, which, if applied to chimneys in which the air is strongly heated, might lead to important errors.

* In the formula of Peclet, and consequently probably here, L expresses the length of the flue which opens into the chimney below, the diameter of which is supposed equal to that of the chimney. D is the length of the side of the chimney supposed square, t and T, as before.—ED. F. I. J.

ON AN ELECTRIC LIGHT REGULATOR.

BY M. SERRIN.

THE electric light is quite a modern discovery. About the year 1730, when it was first observed in England, it was possible to obtain only a few phosphorescent gleams. In France, in Dufay's hands, these gleams became sparks darting from the body and face of an electrified person. These sparks then shone brighter in the Leyden jar, and, as the machines became more perfect, gradually developed into two great discoveries of the age—the voltaic pile and electro-magnetic action; so that by means of electricity we now obtain the most dazzling light and the intensest degree of heat. Hardly thirty years since, the luminous and calorific effects of powerful batteries were first studied, and contrivances are already devised for the purpose of rendering these effects continuous and constant. M. Serrin's regulator, which we propose to describe, is one of the latest inventions, and is distinguished by new and ingenious solutions of the chief difficulty of the problem.

Before describing the mechanism which gives a distinctive character to M. Serrin's regulator, let us briefly indicate the general conditions which a regulator of the electric light ought to fulfil.

There must be a pile having at least 50 Bunsen's elements of ordinary size to produce a good light. 100 elements united in tension give a more brilliant light; but this, again, is far surpassed by arranging them in two batteries each of 50 elements, so as to produce quantity.

It is well known that the current produced by such batteries is in some degree like the lightning's stroke, and that there is real danger in closing the circuit by touching the positive pole with one hand and the negative pole with the other. Nevertheless, this energetic power, incessantly reproduced, manifests its presence by no external sign, whilst it is propagated through a circle formed of thick metallic wires. It shows itself with violence only on closing and breaking the circuit. If sharply closed, only a bright light is seen; if the circuit be suddenly broken, a bright light is also visible, generally of a different aspect; but if the two wires, or rather the two bodies which should complete the circuit, are made to approach each other, so that the circuit, precisely speaking, is neither wholly open nor wholly closed, then the double phenomenon becomes permanent and the light extremely

brilliant. No matter can resist this heat incessantly renewed, which is maintained as long as the action of the pile lasts—that is to say, for days together.

Thick rods of gold, iron, and platinum melt like sealing-wax, and their vapours give various colours to the luminous envelopes which seem to unite the two poles. Silica, alumina, and the greater number of the most refractory substances, taken separately, are alike fused and volatilised. There is, however, one substance—the only one, perhaps—which in some degree resists the action of this furnace, and which, by a conjunction of favourable circumstances, is a good conductor of electricity (a condition indispensable to the object in view), can be fashioned in any form, and is, moreover, neither rare nor dear. This body is charcoal, such as concretes in gas retorts, or which can be prepared in pieces by particular processes. Round or square perfectly even rods are made of it, about thirty centimètres long, and varying in thickness from five to ten or twelve millimètres. Two of these rods are adapted at one of their extremities to suitable metallic pieces, one terminating the positive wire, the other the negative wire of the pile. These wires of good red copper, from three to four millimètres in diameter, covered with silk or cotton, may be several hundred mètres, or even several kilomètres long, according to the distance between the pile and the extremities of the wire. The positive and negative charcoals are generally superposed vertically. Were their free extremities planed and placed in perfect contact, the current introduced by means of the commutator would not manifest itself: it would pass into the charcoal as into the copper wire, without giving any outward sign of its presence. The circle would be completely closed.

But if in the apparatus or regulator containing the charcoals there is an electro-magnet provided with a movable armature conveniently disposed, the passage of the current would cause the armature to fall, and this movement communicating itself, for instance, to the supporter of the lower charcoal, would depress it from two to three millimètres, whilst the supporter of the upper charcoal remains fixed. It is clear that the free extremities of the charcoal being no longer in contact, the circuit will be broken, light will burst forth, and that the phenomenon will persist, under the single condition that the circuit is neither completely closed nor broken—that is to say, beyond the limits which the current can traverse.

The better to appreciate other phenomena, let us now carefully examine the effects produced on the charcoals.

Charcoal resists fusion, but it is acted on by a kind of molecular disintegration, which rapidly wastes it, the result either of the simple action of the intense heat or the current itself, which tears off and transforms the last material particles. The wear is unequal, that at the positive being generally about twice as great as that at the negative. The combustion of charcoal by the oxygen of the air is of little account, for no marked difference is observable when the charcoals are kept in an atmosphere of nitrogen. It will be observed that the incandescence of the positive pole occupies more length than that of the negative, as if the latter underwent a less degree of heat. In consequence of this destructive process, the space between the two charcoals becomes in a few minutes enlarged. At first only two or three millimètres, the distance soon increases to eight, ten, or even more, according to the nature of the charcoal and the force of the current.

To observe these phenomena to the greatest advantage, we must project on to a screen the image of the charcoals magnified eight or ten times, when the light becomes supportable, so that observers can study with facility the series of appearances which present themselves in this focus of light and heat, apparently so constant, yet so agitated. We cannot now enter into the details of the curious observations which have been made on the impurity of charcoals, on the coloration of the flames by the substances introduced into them, on the fusion of bodies placed, not in contact with the charcoals, but in the intervening space. We will confine ourselves to stating that the intensity of the light is notably diminished by a kind of waster, which forms from time to time on the point of the negative charcoal by the accumulation of particles from the positive charcoal, as if by the current. These wasters disappear and reappear at intervals, but they are very rarely observed with certain charcoals and at certain degrees of intensity of the pile; consequently, careful selection of the charcoal must be made in order to secure a more constant light.

The interval between the positive and negative extremities cannot be indefinitely increased in the regulator, and for two reasons:—1. The intensity of the current diminishes in proportion to the extent of this interval. 2. The intensity of the light diminishes with the force of the current. It is necessary, then, to limit the increase of the space to prevent the diminution of the light. This is one of the most important and one of the most delicate functions of the regulator; and for this purpose M. Serrin's mechanism is unrivalled in ingenuity. It is evident that the electro-magnet previously mentioned is the regulator of the motive power to coadapt the charcoal; but this adaptation is a very complex process. 1. The centre of the focus of light must remain at the same level. 2. The charcoals must not come into contact, as the circuit would then be completely closed and the light extinguished, at least for a moment. 3. The movement must be made exactly at the right instant; that is to say, before the current has undergone a certain, hardly perceptible, diminution.

It is especially in accomplishing the last condition that M. Serrin's regulator acts with unequalled precision.

The armature of the electro-magnet can be likened to the scale of a balance with a fixed weight, of which the balancing space is limited to 3 or 4 millimètres by tangent screws, and which, instead of having counter weights on the other side, are supported by two springs, one fixed nearly in equilibrium, while the other receives a variable tension by a movement of the screw. Such a scale is easily made to descend by the superaddition of 10, 20, or 30 grammes, according to the degree of tension to be given to the second spring. Such is the principle on which M. Serrin has formed his ingenious apparatus. His armature is connected with all the supports of the negative charcoal, and oscillating vertically and freely within the narrow limits of 3 or 4 millimètres, the two springs keep it raised, and the superaddition making it descend is the attractive force of the electro-magnet. This force decreases with the force of the current; consequently it decreases when the charcoals, from being worn away, leave too great a space between them, and the light begins to fade.

The variable tension of the spring is, in fact, regulated by this datum. The instant this minimum is reached the scale ascends; that is to say, the spring raises the armature, the surcharge due to the electro-magnetic force having become insufficient to restrain it.

These improvements seem to us all the more important, since M. Serrin, in constructing his regulator, has succeeded in uniting the freedom and accuracy of the automatic movements with a solidity which excludes all accidental causes of derangement.

We have proved that this apparatus is not less fitted to receive the induced current proceeding from powerful magneto-electric batteries set in motion by a steam-engine of three or four horse-power. In this case, the current is not continuous, but alternately positive and negative. There is no need of much complication in these batteries to rectify the current, leaving it in its original uncontinuous state; but in this case rectification is useless, the regulator adapting itself perfectly to the disconnectedness and to the alternation.—*Comptes-Rendus.*

PETROLEUM AND LIVERPOOL.

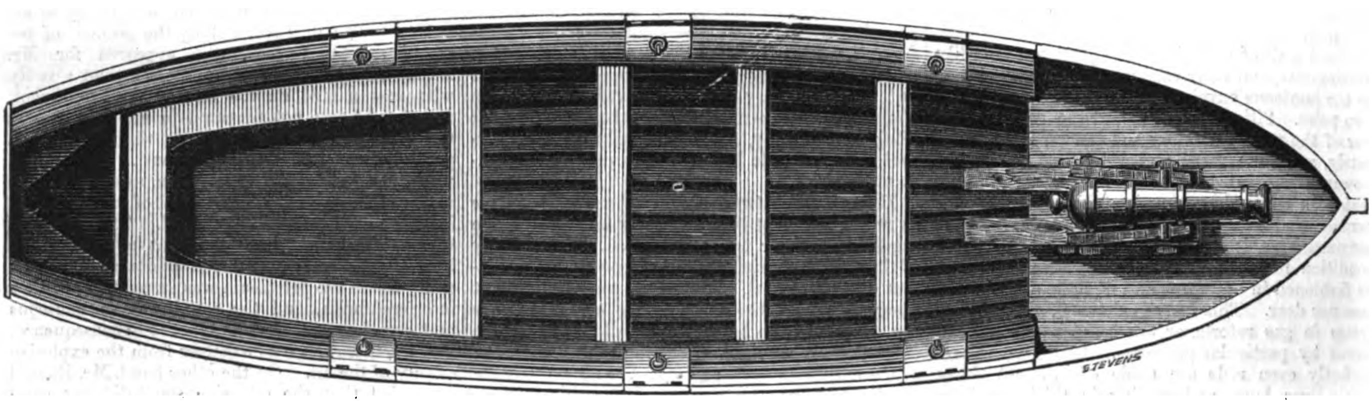
SINCE our article in last week's MECHANICS' MAGAZINE was written, several important proceedings have taken place in Liverpool relative to the Petroleum question. At the Liverpool Assizes we find that John Bigham, a Liverpool merchant, appeared to answer an indictment charging him with causing a serious nuisance and injury to the public health of Liverpool by the storage of petroleum. Mr. Russell, who appeared for Mr. Bigham, said that there were no less than seventy witnesses named on the back of the indictment, and that he was not prepared to meet the case at the present assises; he asked, therefore, for a postponement until the winter court. Mr. Littler, who appeared for the prosecution, said that if the case was postponed, a great deal of mischief and inconvenience might be created. The nuisance was so great that for the extent of a mile the health and comfort of the inhabitants in the vicinity where the petroleum was stored were greatly interfered with, and the smell was so nauseous that even horses lost their appetite in consequence. Besides, there was also a danger from the explosive quality of the oil. On the other hand, Mr. Russell contended that the offensive smell did not arise from the storing, but from the manufacture of the oil, and that, though the process of manufacture was conducted near the defendant's premises, he had no personal interest or control over it. Mr. Liddell, Q.C. (who sat as judge), retired for a few moments to consult Mr. Justice Mellor, and on his return intimated that he should call upon Mr. Bigham to enter into recognisances to appear at the next assizes. In the meantime, however, should any serious or special damage arise from the storage of the oil, the defendant would be held responsible. Mr. Bigham was then formally bound over to appear, or forfeit 500*l.*

At the magistrates' chambers, on Wednesday week, Mr. M'Gowen appeared before their worships in support of an information laid under an Act of Parliament, passed on July 7 last, against Mr. B. Platt. The act — the Liverpool Fire Prevention Acts Amendment Act, 1862 — enacted "that it shall not be lawful for any person to carry on in any place other than a building detached by seventy-five feet from any other building the trade, business, or employment of the boiling of oil, blubber, or tar, or the distilling of turpentine, or the manufacture of vegetable or mineral naphtha, or of varnish, and the distilling or manufacture of petroleum and its products." The defendant, Mr. Platt, had premises in Greenland Street, off Parliament Street, for refining petroleum, and these premises were within the distance mentioned in the Act of Parliament. Mr. Sandys, who appeared for the defendant, did not deny that the premises were within the specified distance, but complained that, as the Act of Parliament had only come into force the day before, reasonable time had not been allowed, and he asked for an adjournment to allow the defendant time to work the stuff up. Mr. M'Gowen said notice had been given in the newspapers. After some conversation, the bench consented to adjourn the case for seven days.

The next day this much-vexed question came before the Liverpool Health Committee, a report being submitted by the Town Clerk, which stated that, "as the medical officer was not in possession of evidence to show that the effluvia were injurious to health, no proceedings could be taken under the Liverpool Sanitary Act; and as under the General Nuisances Removal Act the justices can only insist on being satisfied that the defender has used the best practical means for abating such nuisance, the Health Committee could not effectually deal with the subject. To proceed by indictment at common law was an expensive process, and one which the committee could not enter upon without the sanction of the Council. Steps had been taken to lessen the nuisance in Greenland Street, where a refinery had been set up, the owner having been summoned, and having obtained a week's indulgence before being made amenable to the provisions of the new Local Fire Prevention Act."

The Chairman said, he thought it might be suggested to the Council to provide a place for the storing of petroleum, such place to be ventilated by means of a large shaft, so as to prevent a nuisance. It was then agreed to send a deputation to the Finance Committee, and confer with those gentlemen upon the Chairman's suggestion.

AN IMPROVED LIFE BOAT.



Mr. A. Lamb, of Southampton, and Mr. J. White, of West Cowes, Isle of Wight, have patented "Improvements in Life Boats," which they describe as follows: —

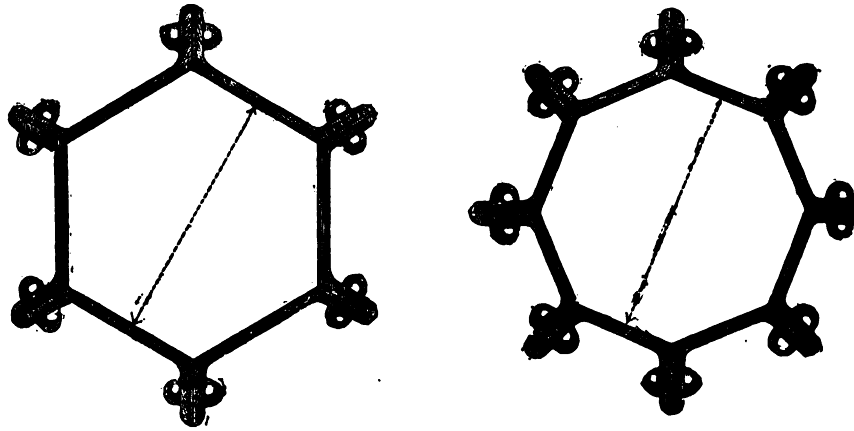
This invention relates to certain improvements in the construction of sea-going life boats, by which, in addition to their quality of safety for life-saving purposes, they are adapted for war purposes, being capable of carrying securely a piece of ordnance in the bows.

We construct life boats, with longitudinal water-tight compartments or air chambers formed on each side of the boat, and extending from stem to stern, or between the bow and stern compartments, and carried up to the gunwale; these are combined with bow and stern water-tight compartments extending from side to side of the boat; these bow and stern compartments should be only of such a height from the bottom as to leave a space below the top side of the gunwale, the space thus left being made available for seats when not designed to be otherwise employed; or in certain cases these compartments may at the sides extend above the line of gunwale, leaving a flat space or recess sufficiently below the line of the gunwale to enable the weight of persons seated in such recess to be kept as low as possible. For the purpose of carrying a gun forward, the water-tight compartment of the bows is extended in length sufficiently far aft to provide a suitable bearing for the gun carriage, and to enable the gun to be worked clear of the mast, and by the additional buoyancy, which is obtained by the increased capacity of this compartment, the gun may be floated in the event of the longitudinal water-tight compartments becoming damaged by shot, or their floatative power otherwise destroyed.

In constructing boats, we insert several air-tight transverse partitions, bulkheads, or divisions, and introduce into each separate air-tight chamber or space thus formed, a "water-tight scuttle" or cover. Each separate chamber thus formed may be employed as a locker for stowing ammunition, dry provisions, sailor's kit, and for other similar purposes. By the division of the longitudinal air cases or chambers the safety of the life boat is increased, and when employed as a gun boat, or when riddled by shot, the stowing-in or piercing of one or more compartments will still leave the buoyancy to float the gun and boat's crew.

By this invention we combine with a man-of-war's pinnace or other boat armed with a gun all the qualities of a life boat, and so enable ships' boats thus constructed to carry and work their guns with greater safety. Each of the divisions of the longitudinal air cases may, in addition to the "water-tight scuttles" on the upper side, have water-tight plugs or valves fitted at the lowest part of each of the divisions of the longitudinal air cases, so that perfect ventilation of the interior may be insured when the boat is out of use. Two or more delivery tubes may be fitted in the bottom of the boat with valves so constructed as to prevent the admission of water from without and free the boat from water, with which she may be partly filled from shipping a sea or from other causes. These tubes may also be availed of for the purpose of taking soundings through them instead of over the side of the boat, as is usually done. Tubes may also be so placed with reference to the centre of displacement of the boat to enable a bower anchor slung under the bottom to be carried out (say to a ship in distress), the ropes and slings passing through these tubes. These latter tubes, as well as the delivery tubes, always serve (independently of any other purpose to which they may be put) to supply air to those who may be confined within, in the event of the overturning of the boat.

HUGHES'S MALLEABLE CYLINDER AND TUBES.

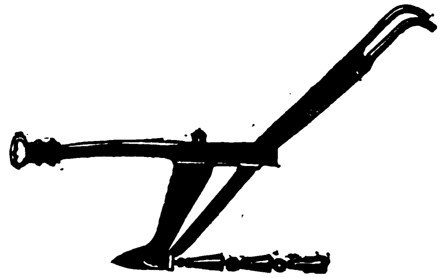


HUGHES'S MALLEABLE CYLINDER AND TUBES.

This invention, by Mr. E. W. Hughes, of Parliament Street, Westminster, consists in constructing cylinders or tubes suitable for columns or supports used in engineering and architectural structures, by forming and combining plates of wrought or malleable iron, each of which is rolled with two outer projecting flanges, which are produced at angles greater than a right angle to the plane or outer surface of the plate. The angle at which each flange of an iron plate will stand to the plane or surface of the plate will depend on the form of the intended column or similar tubular support which is to be made; but in all cases the outer or butting faces of the inclined flanges of the plates used will require to be radial with the centre of the column or similar tubular support.

The above engravings illustrate sections of two columns, one section having eight sides and the other six sides.

CARTER'S PATENT DRAINING PLOUGH.



The above engraving illustrates a plough recently patented by Mr. J. Carter, of Tipton, Staffordshire. It has a frame similar to that of an ordinary plough. To the frame a coulter or knife is attached, which coulter cuts into the earth to the required depth. The foot of the coulter is expanded or enlarged at its back (as represented in the engraving) into a conical form, and to the back of the foot of the coulter a series of balls or drags are attached, the drags being chained end to end. They are of a conical figure, the apex of the first cone being linked to the foot of the coulter, and the apex of each succeeding cone being linked to the base of the preceding one. The cones are of gradually increasing size as they are more distant from the coulter. As the plough is drawn through the earth the coulter cuts down to the required depth, and, drawing after it the balls or conical drags, a pipe-like channel is formed, by which the land is drained.

CUNNINGHAM'S PATENT SCREW PROTECTOR.

Fig. 1.

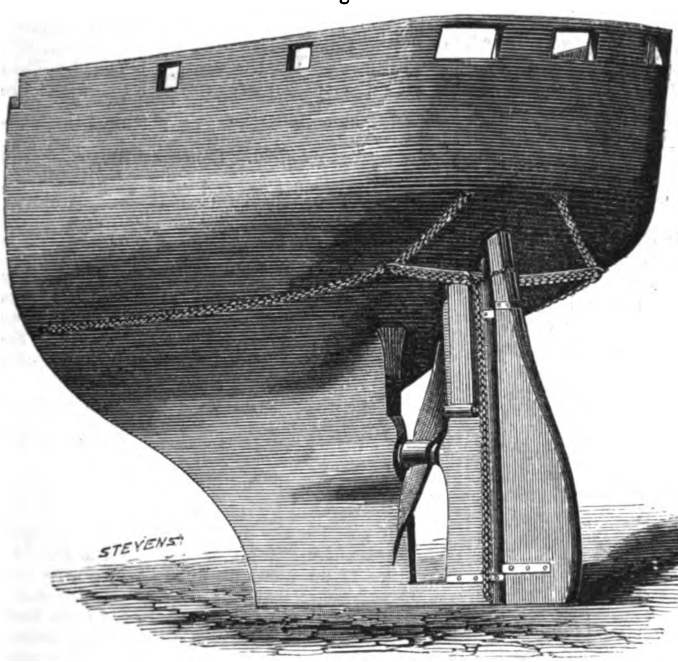
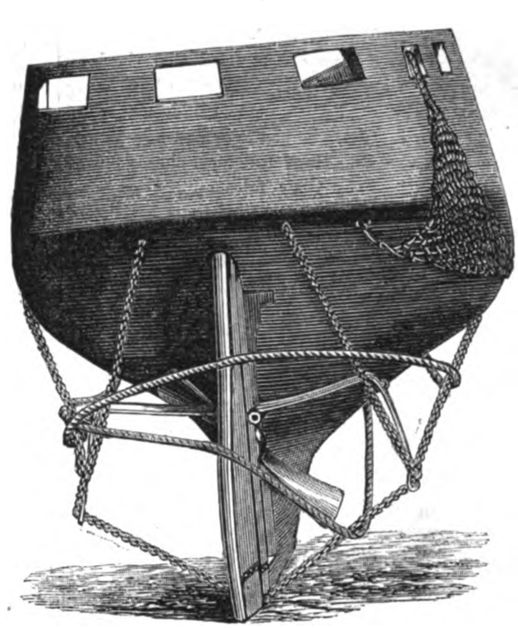


Fig. 2.



In consequence of the remarks of our correspondent, Mr. Hewitt, Mr. Cunningham fears Mr. Hewitt does not understand his invention for protecting screw propellers, and has, therefore, forwarded us photographs, from which the accompanying engravings have been made.

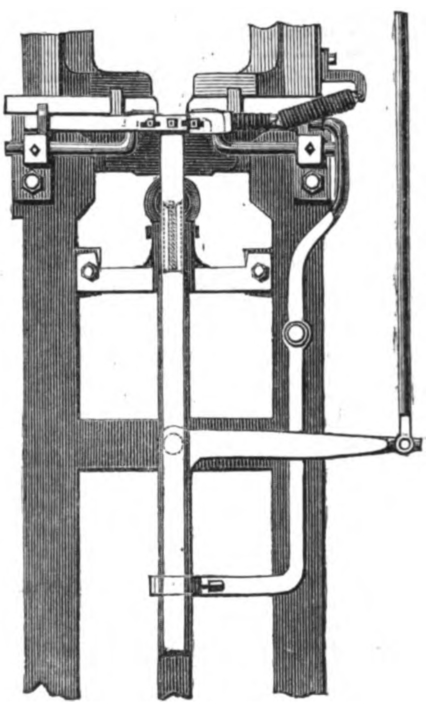
Fig. 1 shows the protector down on guard. Hawsers are represented in positions to foul the screw; the fouling, however, is prevented by the protector. On the starboard side, netting to guard off wreckage, &c., is shown ready for instant application, if necessary. Fig. 2 shows the protector raised when the ship is at sea, so as to offer little or no impediment to her progress through the water. The protector would only be lowered when entering a channel, harbour, or other spot where fouling might be expected, or in the case of ships in war, before going into action.

We have seen no plan for the purpose which seems likely to succeed as well as that of Mr. Cunningham.

IMPROVED MACHINERY FOR THE MANUFACTURE OF BRADS.

MR. W. GORSE, of Minworth, Warwickshire, manufacturer, has patented an improvement or improvements in machinery for manufacturing the cut nails called brads, which machinery consists of an arrangement of parts for guiding and giving a compound motion to the strip of iron from which the brads are cut. The motion given to the strip consists of the ordinary swivel motion, that is, a motion whereby the end of the strip is presented obliquely to the cutters, in combination with a side or lateral motion, whereby the strip is carried backwards and forwards, so as to be operated upon alternately by the bill cutters situated on either side of the bottom or fixed cutter. The object of this motion is to secure uniformity in the size of the heads or bills of the said brads, which cannot be effected in machinery of the ordinary kind.

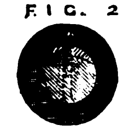
The strip passes through an elastic guide, and the guide is moved laterally by means of a lever which takes motion from the ordinary swivel lever. The lateral motion, combined with the ordinary swivel motion and with the elastic guide, effects the cutting of brads having heads or bills of uniform size, although the strip from which they are

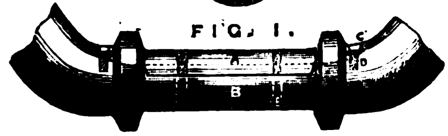


ut may not be of uniform width. The elastic guide is constructed in the following manner:—The guide consists essentially of a bar in which two pegs are fixed, between which pegs the strip is held. The direct motion of the bar is produced by the lever before described, and the return motion by a spring. One of the pegs by which the strip is supported is fixed, and the other is capable of a sliding motion on the bar, being kept to its bearing by means of a spring. The strip is gripped between the fixed and elastic pegs, and the guide is elastic in its direct motion by the yielding of the sliding peg, and is elastic in its return motion by the elasticity of the spring effecting the said return motion.

AN IMPROVED CRANK AXLE.

FIG. 2





THIS invention, by Mr. J. Bird, of Blidworth, Nottingham, consists in forging the axles between each pair of collars, where collars are used, and where collars are not used, at each extremity of the axle, of an oval form, on the side where the wear will mainly be, as seen at B, figs. 1 and 2 of the above engravings, and of a semicircular form on the other half thereof: thus the axle is of an oval form on the side upon which the most wear is, and of a semicircular form on the side upon which the least wear is; each collar has a recess forged or otherwise formed in it to receive snugs C, which are cast or forged on the ends, and form part of a piece of iron or other metal A, which is shaped in such wise that when one of such castings or forgings is laid on the axle formed as above described, the casting or forging will form the axle round. The piece is secured to the axle by a screw D passed through the snug and into the axle-shaft outside the collars, where collars are used; in wide axles the piece is secured by additional screws E, which are passed through the axle and into the piece, whereby when the piece A is worn nearly through by the pressure of the bearing upon it, it can be readily replaced by another piece.

The workmen of the Viaduct Works, Crumlin, Monmouthshire, have recently celebrated the completion of an iron railway bridge for Portugal by a dinner. The order for a new bridge was received at Crumlin on the 12th ult.; and by the 1st inst., or in eighteen working days, the work was ready for shipment.

New York has now, after being urged, it is said, for ten years, introduced steam instead of hand fire-engines. These steam fire-engines now made are said to be more compact than those which were first introduced. They use steam at a pressure of about 100lbs., and the greatest favourites have horizontal cylinders, and are direct acting.

THE TRUE PRINCIPLES OF AIR NAVIGATION EXPLAINED.

TO THE EDITOR OF "THE MECHANICS' MAGAZINE."

Letter 2.

Sir,—Perhaps it may be asserted that the laws of mechanics and the rules of algebra have never been carefully applied to the achievements of flying animals; but, whether so or not, here is evidence of a very important and most simple law of nature mystified by their false application, and rendered totally incomprehensible to us because of their erroneous interpretation, but which, if correctly interpreted, is so constituted as to be the means of inestimable advantages to mankind, both morally and commercially.

That very important property peculiar to aeriform bodies evidently has never been recognised in this field of enquiry, viz. the *elasticity* of the air. Indeed, I firmly believe that the operation of this property in generating a fulcrum for resisting the actions of flying animals, has never been even suspected, and therefore never before discovered; for all to whom I have communicated my theory reject it as untenable, when considered apart from a vessel employed to confine it. I must acknowledge, however, that I have, during the last three years, laboured under the inability to express my views in simple and intelligible terms, having been, in the absence of any information experimentally obtained till now, unable to verify it.

This *anti-gravitating* property enables the air to repel its particles with equal force in every conceivable direction, through all variations of temperature, altitude, or volume, and therefore to resist any surface rightly employed to displace or compress it, with a force increasing in the exact ratio to its density or compression; and such compression is increased in proportion to the velocity of the impelling surface. The atmosphere enveloping the earth, is by its own weight, at or near the level of the sea, compressed with a force equal to about 14½lbs. upon the square inch, and consequently a surface propelled in any direction must increase its compression in the direction of motion. The additional compression to which the air is then subjected, will of course depend on the velocity of the impelling surface, which will and must exceed the velocity of the air therefrom acquired, else no equilibrium would be disturbed, or resistance to that surface experienced; but, in relation to that surface, i. e. if moving at equal velocities, the air would be as if stationary, as when a balloon floats in the air. Nor can the air have a greater velocity than the impelling surface, because the friction amongst its particles tends to retard it.

When a bird works its wings, its strength is distributed over their entire surface, and, whatever be the resistance offered by the air to those wings, such resistance will be entirely due to the *elastic force* of the column of air covered by the surface of those wings, which alone counterbalances the gravitating influence of the earth upon the bird to the extent of the *power* by which the wings are worked.* Now as the *strength* of the bird is distributed over the entire surface of its wings, so also is its weight; for the wings support the body when it is sustained in the air, and the resistance opposed by the air to that surface equals the power impelling that surface, and consequently neutralises or exceeds the force of gravity upon the body. It is therefore clear that the power of the animal is expended in imparting motion to its propellers, and the propellers impart motion to the air, the velocity of which, as already shown, cannot exceed the velocity imparted to the propellers. The power and density of the body are therefore sustained by the elasticity (which varies with the density) of the column of compressed air covered by such surface. Consequently the density of the body must be proportional to the density of the air, and the density of the air is proportional to its compression, and its compression proportional to its velocity. Therefore the elastic force of the air is proportional to its velocity, because the velocity is proportional to the compression.

From the foregoing it is clearly demonstrable that, as the bird's weight on the surface of its wings is to the atmosphere's weight on the same surface, so must the velocity of the bird's wings under its own weight be to the velocity of the atmosphere under its own weight; for truly there is the closest connection between these quantities, and which displays their law of mutual dependence. Therefore, by multiplying the unit of the atmosphere's weight by the surface of wing, and dividing the product by the bird's weight, we find their comparative weight; and by dividing the unit of the atmosphere's velocity by the comparison of their respective weights, we get the comparative velocity, or the true velocity of the bird's propellers. Thus:—

$$\frac{P \times S}{W} = c \text{ and } \frac{V}{c} = x,$$

where P is the weight of atmosphere, S the surface of propellers, W the weight of body, V the unit of atmosphere's velocity, c the comparative weight, and x the comparative velocity.

We have no means of ascertaining the actual velocity of the atmosphere—in its own body, the open air—when set in motion by an impelling force equal to twice its own pressure; but as the air has been found by careful experiment to rush into a vacuum at a velocity of about 1,300 or 1,400 feet per second, we may reasonably allow its velocity to be reduced 10 per cent. by friction amongst its own particles, when set in motion in mid air by an impelling force equal to one atmosphere over its own pressure: if so, we have 1350—135 say 1,200ft. per second as its velocity under such impelling force. Now, if we take the unit of pressure at 14½lbs., and the unit of velocity under such pressure at 1,200ft. per second, we shall find that it gives results far more true to Nature, and surely therefore more applicable to the subject, than any formulæ given by the most "eminent authorities" respecting the resistance of the air (and which is indeed limited to surfaces projected continuously in the same direction only, or to the wind on a body at rest). I am aware that I stand alone in this view of the problem, and, being "an outsider," must not expect to meet with supporters; but I am fully convinced of its truth, and the strongest terms which can be employed against it will ever fail to disprove it.

This brings us now to the important question at issue, viz. What, then, is the true velocity required of such surfaces to raise their respective weights?

The experiments on the two birds given before show that the male bird, with a surface of wing equal to 41·75 sq. in., propelled through a distance of 1·82ft. at each stroke, was capable of raising a weight equal to 1·8lbs. What, then, was the true velocity required of that surface? As above, we have P = 14½lbs. S = 41·75 sq. in., and W = 1·8lbs., to find c (comparative weight), and, V = 1200ft. divided by c gives x the velocity required. Then if a be the space through which the wings are propelled at each stroke, $\frac{x}{a} = y$ will be the number of actions required. Consequently,

$$\frac{14 \cdot 5 \times 41 \cdot 75}{1 \cdot 8} = 336 \text{ c. w., and } \frac{1{,}200}{336} = 3 \cdot 57\text{ft., the}$$

velocity required. Therefore $\frac{x}{a} = y$ or $\frac{3 \cdot 57}{1 \cdot 82} = 2$ is the number of actions; so that four strokes only per second is required of the male bird to raise its natural weight and load, and not 29 actions or 58 strokes per second, even if it were possible for the bird to perform them, as required by the rules generally received.

The table given *below* forms a striking contrast to the preceding one, in which the resistance was taken as increasing according to the law of the square of the velocity.

By comparing these tables, we see that if the resistance opposed by the air to the surface of the wings is taken as the square of the velocity, a bird cannot raise its natural weight without the expenditure of an immense power incessantly impelling the wings, requiring the male bird to make at least 25 actions per second, and the female bird to make 24 actions per second; and if they ceased the action of their wings for one second, they would fall to the ground by the force of gravity; because they would require this constant velocity to elevate and support the natural weight of their bodies in the air, and a much greater velocity to obtain any surplus momentum for progression.

We may therefore pardon writers on natural history or air navigation for asserting that "birds are liberally supplied with air-cells for reducing their specific gravity;" for the most careless observer must have noticed that they not only possess power sufficient to fly with perfect ease, but even to gain an increasing momentum sufficient to propel the body for several seconds after all action of the wings has entirely ceased. On the other hand, if we admit the elastic property of the air to operate as freely in their behalf as it has been found to do in our experiments, we see at once an extension of the design and importance of one of the most striking features of the constitution of the atmosphere — its elasticity (without which it could have no tendency to expand)—universally adapted by the Creator for sustaining all flying animals, demanding but a moderate velocity of their wings, and enabling them to maintain their actions with perfect ease: requiring no more than two or three actions per second to raise an additional weight nearly equal to that of their own bodies.

Moreover, the resistance of the air according to the law of the square of the velocity, is only sensibly experienced with tolerably high velocities, a velocity of 5·9ft. per second, or four miles per hour, only producing a gentle wind termed "a zephyr breeze." If this law of man, which, indeed, is very limited, was a law of Nature, it is evident that the myriads of insects who pass so much of their time

Surface of wing	Weight of air on surface of wing	Weight of body on surface of wing, taken also as one for comparison	Comparative weight of body to weight of air on surface of wing	Velocity of atmosphere per second	Velocity of propellers per second required	Distance propelled through at each stroke	Number of actions per second required
Square In.	Lbs.	Lbs.		Feet	Feet	Feet	
Male bird 41·75	605·4	1·04 1·8	582 336	1200	2·06 3·57	1·82	1·14 2·0
Female bird 35·0	507·5	0·77 1·53	659 332	1200	1·82 3·61	1·57	1·16 2·3
Insect 0·125	1·8	·00018	10070	1200	0·12	·0625	2·0

* As a proof of this it may be stated, that one time when the female bird was let out of her cage, she selected one of her usual spots and alighted; soon after settling she began slowly working her wings, gradually increasing the velocity until the resistance on surface of wing exactly counterbalanced the force of gravity on the body, and during these actions, which were continued about three minutes, the bird remained as if fixed, off her feet, but only about two inches above the surface on which she had previously rested. After thus soaring, she alighted precisely on the same spot, not having effected the slightest change of position in any other direction. By keeping her body nearly in a perpendicular direction, each stroke participated equally in producing the upward or sustaining effect. The tameness of this bird was very gratifying, as she would allow me to conduct the operations of weighing her as correctly, and harnessing her to her load, as quietly as if she appreciated its importance; and when done, would often perch on my head or shoulder, and only leave me on being taken off and put into her cage.

on the wing, would do so under the penalty of the severest toil; so much so, indeed, that their delicate bodies, which contain mechanism of far less tenacity than birds, would be instantly destroyed; although the surface of wing with which they are provided is much greater than that of birds, in proportion to weight. A common blue-bottle fly (selected for experiment), for instance, had a surface of wing equal to 0·125 square inch, and measuring but half an inch each in length, could never be propelled through a greater distance—even if each wing passed through 180°—than $\frac{3}{4}$in. at each stroke; and this surface had to sustain a weight of $1\frac{1}{2}$grs., and was also further capable of raising a total weight of $2\frac{1}{2}$grs. when loaded. According to the rules generally applied (viz. $3{\cdot}3^2 \times 0{\cdot}125 \times {\cdot}00016 = {\cdot}0002$lb. or $1\frac{1}{2}$grs.) it would require a velocity of 3·3ft. per second to obtain a resistance equal to $1\frac{1}{2}$grs. on such surface, or require the insect to make 53 actions or 106 strokes per second! Consequently, if this law of the square held good in nature, the smallest and weakest insects would be doomed to much more violent and laborious exertion than birds, notwithstanding the superiority of their wing surface, the difference in this case being eight times greater in proportion to weight than that of the birds before given. How different the result if taken according to the principles of Nature, 2 actions per sec. being quite sufficient, viz.:—

$$\frac{14{\cdot}5 \times 0{\cdot}125}{{\cdot}00018} = 10070, \text{ then } \frac{1200}{10070} = {\cdot}12\text{ft. and } \frac{{\cdot}12}{{\cdot}0625}$$

= 2 actions nearly. If we carefully observe the actions of insects, we shall find that they, like birds, rest on their wings, and at frequent intervals suspend all action entirely for a time, darting about during such suspension with the greatest facility from the momentum previously obtained, and merely renewing the action as occasion requires. The actions of some insects are, however, more constant and uniform but very slow, as the butterfly, for example, whose slow movements may be distinctly observed and counted.

The examples already quoted are, I believe, quite sufficient to establish the close connection and law of dependence existing between the density of flying animals and the density of the medium for sustaining and resisting their actions, and also between their respective velocities, and place beyond the bounds of refutation, that the following are the *true* and universal *principles* upon which the success of flight depends in Nature, viz. *power* and *weight* transmitted through the medium of the propellers to compress the air, and thereby develope its *elasticity*, by virtue of which alone, the air presents to such power a substance offering an equally resisting force through the entire stroke; and as that power is, so will the resisting force or density of the air be, to the density or weight of the body employing that power—if superior the body will rise, if inferior the power will be wasted.

I shall say something on the motive power in a future letter.—Yours, &c.,

W. Quartermain.

DISINCRUSTATION FLUID.

All who visit the Western Annexe should spare a minute to glance at a case of specimen deposits removed from steam boilers by Eastern & Springfield's patent incrustation fluid. The case is near Eastern & Amos's large centrifugal pump. It is abundantly evident, from the large masses of deposit here exhibited, that this fluid is an active agent in cleansing boilers. We see that one deposit was removed from a boiler belonging to Mr. Henry Cater, of the Grove Boiler Works, Southwark. It shows how thick deposits may be removed from plates and rivet-heads without any injury to the iron works. There is another removed by the fluid from a marine boiler belonging to Messrs. Brownlow, Lumsden, & Co., Hull. But the most remarkable specimen which the case contains is an immense block removed by the fluid from a Cornish boiler belonging to Messrs. Freen & Co., Portland cement manufacturers. This block weighs 47lbs., is between 4 and 5in. thick, and it was originally 2ft. square, but was broken in transit. We are informed that this block took two months to form in the boiler, and that after the fluid was used four times on four successive Saturdays, the crust was removed by hand without chipping. The case contains a variety of other deposits, which are as many substantial proofs of the efficacy of this patent fluid to remove incrustations, which are such a prolific source of weakening boilers and producing explosions.

TO CORRESPONDENTS.

Received—W. H. Y., R. E., St. J. D., Hector, D. J. H., A Constant Reader, W. N., R. H. D., J. J. M., W. H. G., J. H., W. F., E. F., W. B., J. P.

Correspondence.

[*We do not hold ourselves responsible for the statements of our Correspondents.*]

THE STRAIGHT LINE *VERSUS* THE WAVE LINE FOR VESSELS.

TO THE EDITOR OF "THE MECHANICS' MAGAZINE."

Sir,—Mr. Young requests to have his "say" also on this ship-building question, and he is very welcome, so far as I am concerned. He asks me "to read carefully and attentively Mr. Scott Russell's remarks on the wave-line," which very excellent advice, I presume, has been followed by himself in regard to my remarks on the same subject; yet I cannot reconcile such supposition with his saying that I "turn my attention more to the water after it has been disturbed by the passage of the vessel, rather than to the question at issue, viz. how to move the water so that the least power shall be expended in moving it." Now, as to the first point, I have referred to it only to dismiss it, as not belonging to the question; and as to the second, it is the very gist of all I have written on the subject, and what I have made the special matter of demonstration. In my first communication I proved that, taking the parabolic curve as the type of all the hollow lines (and from which they will not greatly vary), the work done by it, and, of course, the power expended by it, is double to what it is in the case of the straight line for a particular distance within which the water is moved, or rather, as it would be better to express it, for a particular distance over which the pressure acts: I speak of a particular or partial distance, and I may add thereto the particular planes, that is, the horizontal ones, on which the hollow lines are described; because the entire work done in overcoming resistance is not comprised in the investigation, otherwise I should be startled at the great disparity in the ratio of 2 to 1, and suspect some error in my conclusions. What, on the whole, may be the comparative rate in the expenditure of power it is impossible to say, but that to some unknown extent it is in the above ratio, is undoubtedly true. Now, until this conclusion be as mathematically controverted as it has been mathematically supported, it is idle work to urge anything that has merely a collateral bearing on the subject, whether it be on behalf of the wave line, or in opposition to the straight line. However, not to be uncourteous, I will proceed to consider Mr. Young's observations.

He says that in a self-formed cutwater of ice, "the lines resisting the current were hollow or wave lines, and there was no disturbance of the water, or throwing off of the ice (as was the case in the piers of the bridges with straight or convex lines), thus showing that the current passed with the least hindrance, and the pieces of floating ice continued in contact with this glacial wave-line cutwater, all the time they were passing." Now, all this is just what one might expect, although viewing the straight line with favour. The destructive tendency of the current is to remove obstacles at any cost of power; nature is not called upon to economise; and so the ice, supposed to have at first a triangular shape, is gradually destroyed just below the apex of the cutwater, where it is weak, until it takes, for that portion of it, the form of least resistance corresponding to its own strength and the velocity of the stream—that is to say, it becomes a more acute triangle, with sides not differing sensibly for some little distance from straight lines; but observe, that this can take place (assuming that the breadth of the cutwater is maintained) only with the necessary consequence of a more obtuse form being produced at a point farther down the stream, and offering greater resistance than the straight line would have done. As this result is gradual, a hollow curve line is generated, with the salient angle at the haunch rubbed off. Notwithstanding the greater obtuseness of form, and the greater resistance it opposes, the cutwater is as enduring at this point as at the apex, because of its greater strength. It is a case of give and take, the acute for the obtuse; and if the sum of resistances for each were equated in the exchange, the result of the alteration from the straight-lined triangle would be a form, not of least, nor, upon the whole, of less resistance, but of greater durability. Unfortunately, however, for the advocates of the wave-line theory, the resistance of water in opposition to motion, and the resistance to be opposed to it when in motion, vary with the squares of the velocities—a fact which is overlooked or disregarded by them; consequently, the mean resistance due to the squares of the several velocities incidental to a curve line is greater than that due to the square of the uniform velocity incidental to the straight line, and, as I have before said, in the case of the parabolic curve, it is double thereof. It may not be superfluous to add here, for the sake of imparting information in some quarters, that the velocities on which the resistances are calculated are those which are destroyed in the case of the cutwater, and generated in the case of the ship, which velocities are variable—although the velocity of the current or of the vessel is constant—on different portions of a curve line, according to their respective obliquities to the line of action. It unquestionably follows from this difference in the velocities destroyed, together with the law of the corresponding resistances, that the current would, on the whole, expend more power on such a glacial cutwater than on one with straight lines. It would expend less at the apex; hence the other form, on which it would expend more, throws off the water at that point with some degree of violence; but then the haunch is spared the excess of pressure consequent on hollow lines, and the pieces of floating ice would be less likely "to continue in contact with the cutwater all the time they were passing." The circumstance of their tendency to do so, and in aggravation of friction, although cited by Mr. Young as a sign "of the current passing with the least hindrance," is regarded by me as a proof of just the contrary. I know that Mr. Scott Russell, in his experiments, took the same view of the subject, in reference to floating pieces of cork clinging to the side of his vessel; but I take it that this is only another example of a wrong interpretation of phenomena.

Dr. Thomas Young, a long time ago, and long prior to the advent of Mr. Scott Russell, pointed out the dead water which he said forms in front of a bluff ship, as an indication of what the shape of the bow of a vessel ought to be. But such forms I consider to be only the necessary consequence of a destructive assailing force on easily disseverable materials, and are not to be followed when we become the assailants, defying all erosive action, and where the great object is to economise power. The analogy would carry us too far, and land us in error; for instance—the greater the velocity of the stream, the less will it mould such a cutwater into acuteness of form; therefore, the greater the speed required from a ship, the less acute should be its bow! Is Mr. Young satisfied with this aspect of the analogy? Will he acquiesce in this exemplar, for our imitation, as to the way in which "Nature works on unerring principles?" Nature cannot err, but we may err in misunderstanding and misapplying her principles. Wheels are better than legs, or any imitation of them, for our locomotive contrivances; and the propelling action of fins and tails is no desideratum in nautical engineering; neither do we want the bows of our vessels to be fashioned after the model of a "glacial cutwater." It would be more to the purpose to take the form of a fish, though not quite; for we wish to keep our skins dry, and fishes would rather keep theirs wet. In regard to the other example of a wave line, in the plough, I have only to observe, that for certain practical objects it is an excellent form; it is also theoretically correct on the point of not requiring the expenditure of power to be greater on account of it; but this arises from the fact that the resistance here does not vary with the square of the velocity, but remains constant at all velocities.

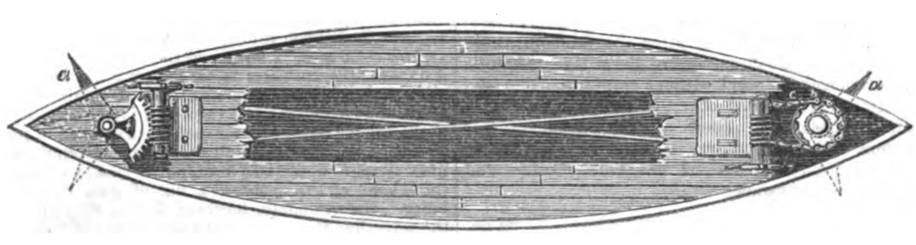
I am, Sir, yours, &c.,

Benj. Cheverton.

August 25.

SHIPS' RUDDERS.

Sir,—Referring to the official trial, by order of the Admiralty, of the plan proposed by Commander Warren, R.N., for steering ships with an auxiliary rudder fixed in the deadwood forward, which, although it



took place under unfavourable circumstances, the result, nevertheless, showed an improvement in steering; but it is not stated how many men were required to work the fore-rudder.

If our Warriors and Black Princes require twelve men to get their stern-rudder over 14 or 15 degrees, it is evident that they would require as many more to hold in the fore-rudder at the same angle, or pull it back against the pressure of water, supposing them constructed on this principle, and the fore equal in power to the stern rudder (which it ought to be)! In this case, a Warrior would require some fifty men with relays to work her rudders! But as our men-of-war require to be turned and manœuvred in as little time as possible to be perfect, why not at once give those which have to be constructed two powerful rudders, one fore and the other aft, and connect them together as in the above diagram? from which it will be seen that the pressure of water coming against the fore-rudder is made available to pull up the aft one, or, in other words, the power to turn a ship in motion is derived from its own momentum! The power of rudders on this principle need not be confined to their present limits, as, however large they are made, an equilibrium is established and a child may work them. But this steering question is one of such vital importance to our navy that it ought not to rest with the best application of the rudder. What is wanted in a man-of-war is a power, not only to turn adroitly when in motion, but when at rest, by two screws properly applied. Depend upon it, Mr. Editor, before long, the neglect of this important matter will necessitate the reconstruction of our navy again, when it will be found that the present form of hull is not adapted to embrace all that is needed. Time, which wears away prejudice, will show the necessity of abandoning the barrel-formed hull, which tumbles and rolls like a porpoise, and topples over when stranded on a beach.

If our Government would try an experiment in steering at a little cost, there are plenty of vessels on the Mersey, the Thames, and elsewhere, that have rudders fore and aft (both ends alike, as I think all ships ought to be built). These ferry-boats are so built to prevent the necessity of turning round, and the rudders are used alternately. Now, if one of these boats had its rudders connected together as I propose, the effect would be seen at once. In the annexed sketch, *a a* are two rudders, on the post of each of which is keyed a ragged wheel B, on which a strong chain C works. Two tension rods or wire ropes *d*, which cross each other in the middle, are attached to the ends of the chains. The strength of the chains and rudders must, of course, be calculated to resist the pressure of the water, which can be done easily. The helms may be actuated in any ordinary manner, but I prefer to work them by worm *e* and sector wheel *f*, as shown. The helmsman may steer from either end of the ship, by throwing the worm at the opposite end of the vessel out of gear. Now, whichever helm is moved (if the ship be in motion), an immense pressure of water comes against the fore-helm, the power derived from which is transmitted through the cross band to pull up the aft-helm, and the ship swings round with great rapidity, consequent on being acted upon at both ends at once, like the head and tail of a fish! When the helms require to be brought back, the pressure on the aft counterbalances that on the fore-helm, and a child's power is sufficient to restore them to the position they were moved from. Theory would indicate that a vessel on this principle might turn round in half the time, but practice, which generally runs panting after theory, in this case outsteps its fantastic companion; as it will be perceived that the rudders may not only be put about instantly, but may be constructed individually of double or treble the power of ordinary ones, the necessary strength of the different parts coming within the province of the engineer.

I am, &c.,

EVAN LEIGH.

Miles Platting Iron Works, Manchester.

RIFLED CAST-IRON ORDNANCE.

SIR,—In your last number you quote the following words from Mr. Britten's pamphlet on rifled cast-iron ordnance:—"In 1860 I was informed by the Secretary of the Ordnance Select Committee at Woolwich, that a recommendation should be made by that body to the War Office, to the end that a gun of strong material should be prepared for the purpose of testing my system, with the muzzle-loading shunt system proposed by Sir W. Armstrong, but, for some reason that I am at a loss to account for, this recommendation was never made." You, on this, remark that Mr. Britten "is 'one more unfortunate' who has had to work out his invention in the face of difficulties and restrictions. He has met," you say, "but small encouragement at the hands of those whose duty it is to examine all plans fairly."

These reflections on the conduct of the Ordnance Committee would be just, if Mr. Britten's statement were true; but his memory has singularly failed him on this subject. Not only did the Committee "recommend" a strong gun to be prepared to test what he calls "his system" with Sir William Armstrong's shunt system, but they carried out the recommendation with two guns, *Mr. Britten superintending the rifling of both, and himself preparing the shells*—68-pound shells, 6½in. in diameter, so as to compare fairly with the Armstrong 70-pound shells of the same diameter. These guns were fired at Shoeburyness on the 18th and 19th February 1861, *Mr. Britten being present.* He desired the charge of powder to be 8 pounds, and his wishes were acceded to. The practice was extremely bad. The fact was that Mr. Britten, so late as 1861, was so utterly ignorant of the laws of motion of projectiles from rifled guns, that he had given to the cannon destined to fire long 68-pound shells only the same spirality of grooving as had proved sufficient to steady the flight of his short 48-pound shells. The consequence was that the long shells were actually less accurate in range than ordinary round shot. If Mr. Britten disputes this, let him publish the exact results of the firing of his shells on the 18th and 19th of February, 1861. You are misinformed, Mr. Editor, on another point. You believe that no cast-iron gun, rifled by Mr. Britten and fired by the Ordnance Committee, "sustained any damage from the operation."

So far from this being the case, a 32-pounder (not bored out even to the size of an ordinary 32-pounder, which is upwards of 6¼in., but only to 5in. diameter) burst with less than forty rounds of only 6½lbs. of powder and 34-pound shells. Mr. Britten has since reduced the charge for 32-pounder guns to 5lbs. Now, as we know them to be safe with 10lbs. and the round shot, it is not astonishing that they do not burst with 5lbs. and a 48-pound shell. The entire expense of Mr. Britten's experiments before the Ordnance Committee has been borne by the country—in all probability 3,000*l*. It is even whispered that he made a profit on the shells which he insisted on supplying himself. It is only fair that he should be informed of this whisper, and have an opportunity of disproving it. When he has done so, and explained his lapses of memory, it will be time enough to begin to consider his startling recommendation—to *increase* the power of our 32-pounder guns by rifling them in such a manner that they can only safely be fired with exactly half as much powder as is now always fired from them; in other words, to arm our ships with 6¼in. cannon to be fired with 5lbs. charges, in order to match them against French ships, which are armed with cannon of the same size, but so strong that their service charge is 16lbs. of powder when firing against ships. A bolt moved through the barrel of a gun by the expansion of the gas of gunpowder is in exactly the same conditions as any other piston moved through any other cylinder by the expansion of any other gas. If, therefore, Mr. Britten can cut grooves in the barrel of a gun, so that 5lbs. of powder shall, in the grooved barrel, produce a greater result than twice as much in the smooth barrel, it is evident that, by grooving the cylinders of all steam-engines in the same manner, the consumption of coal can be diminished by one-half. Let Mr. Britten propose this seriously to some of our mechanical engineers. When he induces one of them to spend 4,000*l*. on experiments, let him blame the Ordnance Committee for only spending 3,000*l*.

I am, your obedient Servant,

ANTI-QUACKERY.

[The letter of "Anti-Quackery" certainly casts a dark shadow over the published facts and figures of Mr. Bashley Britten. We shall be happy, however, to afford the latter gentleman an opportunity of dispelling the clouds which his antagonist has raised, and shall withhold further expression of our own opinion upon the subject until next week.—ED. M. M.]

THE "EXCELSIOR" SEWING MACHINE.

SIR,—Having been accustomed to read with great interest the valuable articles on the International Exhibition which have from time to time appeared in your pages, I was greatly surprised to find the writer of the article on the Processes Court, which appeared in your impression of the 22nd instant, at page 110, has done such manifest injustice to Messrs. Whight & Mann, of Holborn. In reviewing their "Excelsior" sewing machine, the writer, alluding to its peculiar mode of feeding the work along, says, "One can see that this kind of feed can only do with very light work, such as nimble fingers can effect." Now, sir, as one who has been connected, as a practical mechanic, with sewing machines for many years, I beg to state I differ entirely with the writer; but I have seen the "Excelsior" machine used at a high speed on the coarsest materials—such as four thicknesses of stout fustian. I have also seen it sew, with facility, sixteen thicknesses of brown calico. It is also capable of sewing four thicknesses of leather, and from that down to gauze, with almost equal ease.

Having had an "Excelsior" machine in my possession for several months, I know positively what I here state to be matter of fact. Nor is this at all surprising; for one has only to examine the "Excelsior" to arrive at a totally different conclusion from the writer of the article in question. In the first place, the directness with which the moving power is conveyed to the needle gives it a decided superiority in this respect over those machines in which the power is applied at the short end of a lever to overcome resistance at the end of its longer arm. In the "Excelsior" the power is transmitted from the driving wheel along a shaft, from whence it is received by the needle bar, quite close to the bearing of the shaft on the strong iron casting or frame. Again, the needle and needle bar are both straight, and their motion direct. Moreover, the needle does not feed at its point in "penetrating the cloth;" but when it has entered the cloth so as to bring the resistance very near its shank—which is of peculiar size and strength—then it feeds the cloth along; and the thicker the fabric the firmer the hold given to the needle. In fact, I know of no machine having an equal weight or substance of its parts, which is of equal strength, or that will do a greater range of work. As the study of the "Excelsior," from the nice adaptation of its parts, and the beauty of the principles involved in its construction, has afforded me, in common with several mechanical friends, very great pleasure, I trust you will excuse my troubling you with these few observations. As most of the proprietors keep drawings and blocks illustrative of their machines, I shall endeavour to obtain such; and, should you afford me the opportunity, shall attempt further to elucidate the beautiful mechanical principles employed in the "Excelsior."

I am, Sir, yours respectfully,

RICHARD ALLISON, C.E.

8 James Terrace, Leyton Road, Stratford-le-Bow, August 26, 1862.

STEEL SHIPS OF WAR.

SIR,—From your notice of Mr. Bertram's letter, in your number of 15th inst., it may be inferred that I have taken out a patent for my plan of constructing war vessels entirely of armour-plates welded together. This is so far from being the case, that my principal object in writing the letter noticed by "Civilian," and referred to by Mr. Bertram, was to give the idea such publicity in your columns as should for ever prevent the possibility of a patent being subsequently granted for it, and of a great national object being thereby obstructed. The same motive induces me to request you will give publicity to a sister scheme—that of constructing our war ships of steel at a single casting.

I am, Sir, your obedient Servant,

ROBERT AYTOUN.

August 28, 1862.

Gossip.

On September 28, 1836, George Crane, then of the Yniscedywyn (there, you can't pronounce that, dear reader, if you are not Welsh, so we had better tell you it's Enni*sked*win, with the accent on the *ked*) Ironworks, near Swansea, South Wales, patented the use of Neilson's hot blast in connection with anthracite coal. Making iron in those days with any other fuel than charcoal or soft coal was no joke. Mr. Crane got on bravely, however, with anthracite, and the Welsh anthracite — what there is of it — is a fair article. One of the parties who had received a perpetual grant of all the water power on the Lehigh, on the condition of expending 30,000 dols. in building an iron furnace on its bank, came off to England with the intention of looking up Mr. Crane. Accidentally meeting him in London, our friend described to Mr. Crane the capacity and wants of the Lehigh region, and was referred to Mr. David Thomas, who was at that time connected with one of the largest ironworks in South Wales, and who was thoroughly *au-fait* in making anthracite iron. Mr. Thomas, after due negotiation, was engaged as engineer, and some time in 1838 or 1839 he was on his way to the New World. He had ordered two blowing cylinders, 5ft. in diameter and for a 6ft. stroke, to be cast and bored at the Soho Works. These cylinders were duly shipped on board a vessel, which, having had heavy weather on the voyage, put into Norfolk in distress. Had the skipper had tackle sufficiently strong to hoist the cylinders out of the hold of the ship, they would have gone overboard in the middle of the Atlantic. Mr. Thomas, in the meantime, had begun a 12ft. furnace — the first anthracite furnace on the Lehigh, and still in blast — and he could not be kept waiting for the blast tubs, as they had begun to be called. Merrick and Towne, of Philadelphia, were accordingly applied to cast others. But, in the year of grace 1839, the great engineering establishment of the United States could not undertake the casting of a 5ft. cylinder. It was too large a job. There was much delay, but, finally, upon a guarantee to be relieved of all risk of failure, the proprietors of the Southwark Foundry proceeded with the casting, and were successful. The blowing engine was set up, and iron was first cast on July 4, 1840. Thus was started the first furnace of the now prosperous Lehigh Crane Iron Company. The proprietors have built a handsome town at Catasauqua, two miles or so above Allentown. The place now numbers some 2,000 inhabitants; it is supplied with water pumped by steam power, is lighted with gas, and is, altogether, about as attractive and go-ahead a town as can be found, of the same size, in any part of the United States. The Lehigh Crane furnaces at Catasauqua are now five in number, respectively 11ft., 13ft., 16ft., and two of 18ft. diameter. Their total production is 42,000 tons of iron yearly, worth 1,000,000 dols. in New York. There are several other large furnaces in the neighbourhood.

The exportation of iron in its various forms experienced some reduction last year, the total value of the iron and steel sent abroad having been 10,341,574*l*., against 12,154,997*l*. in 1860. There was an increase in pig from 974,065*l*. to 1,047,318*l*.; but bar, bolt, and rod iron declined from 2,385,871*l*. to 1,885,605*l*.; railroad iron, from 3,408,759*l*. to 2,903,357*l*.; cast iron, from 832,638*l*.; wire, from 250,087*l*. to 207,317*l*.; wrought iron of all kinds, from 3,317,349*l*. to 2,868,923*l*.; and unwrought steel, from 986,228*l*. to 727,840*l*. It was in 1853 that the export iron trade assumed its present large proportions, having increased in that year to 10,845,422*l*. as compared with 6,684,276*l*. in 1852, 5,830,370*l*. in 1851, &c. The value of the machinery exported last year was never exceeded in any previous twelve months, steam-engines having figured for 1,243,467*l*., and other kinds of mechanical apparatus for 2,976,221*l*.; while in 1860 the totals were 1,238,333*l*. and 2,599,488*l*. respectively. In 1850 the value of the steam-engines exported was only 423,977*l*., and of the general machinery 618,189*l*.; so that during the last ten or eleven years a vast developement has taken place in the demand for British machinery in foreign countries and in the colonies.

Frequently we hear of the progress of the Suez Canal. We are now informed that Mahomed-Said, the Viceroy of Egypt, has announced that the mingling of the waters of the two oceans shall be inaugurated by a solemn fête, at which the representatives of all nations are to be invited. It must not, however, be forgotten that many of the principal engineers in this and other countries have expressed their serious doubts of the canal ever being cut so that navigation may be effected.

On Thursday last week, says the *Morning Star*, some very interesting proceedings took place at and near Ipswich, that town being visited, at the invitation of Messrs. Ransome & Sims, by a party of 200 foreign noblemen and gentlemen whom the International Exhibition has attracted to London. The object of the meeting was to show the distinguished visitors the perfection attained in the production of agricultural implements at the Orwell Works, and also to illustrate the practical working of reaping machines, steam ploughs, &c. The party, who travelled from town by a special train on the Great Eastern Railway, comprised the Marquis de Perales, and the Marquis de Claramonte, from Spain; the Comte de Fleurien, from France; the Viscount de Villa Maior, from Portugal; Count Trinschietti, from Italy; Mr. J. Robinson, from the Cape of Good Hope; M. Lelong, commissioner from the Belgian Government; the Marquis Pepoli, Italian Minister of Agriculture, and a long list of foreign and colonial gentlemen too numerous to mention. Mr. Alderman Mechi and Mr. Fisher Hobbs were also among the guests. The party were conducted through the Orwell Works in three divisions — the first under the leadership of Mr. J. Head and Mr. J. A. Ransome, while Mr. R. C. Ransome acted as conductor to the second division, and Mr. G. A. Biddell accompanied the remaining section, which consisted of English gentlemen only. After devoting some time to an examination of the numerous interesting processes brought under their notice, the whole party of visitors met in the yard, and were introduced in a short speech from Mr. J. A. Ransome to the 1,200 men employed at the works. Mr. Ransome impressed upon the men how greatly they had profited from the liberal patronage bestowed on the works by many of the visitors present; and the vast body of workmen responded with three hearty cheers, the objects of the ovation seeming well pleased with the compliment. The strangers then set out for Mr. Ransome's Swan's Nest Farm, at Westerfield, near Ipswich, where several illustrations of reaping and ploughing were afforded, the steam ploughing being on the Fowler principle. At five o'clock the whole party assembled, to the number of 300, were entertained at dinner in a tent, Mr. R. Ransome presiding. The speakers on the occasion were — Mr. Alderman Mechi, who, in a characteristic address, enforced the necessity of a liberal application of capital to agricultural operations, in order that the requirements of the increasing population of England might be met; M. Spiers, commissioner from France, who expressed his grateful acknowledgements for the courtesy and hospitality which foreign visitors had received in England during the last few months; the Comte de Fleurien, who, in the French language, stated that he and his compatriots had profoundly admired the reapers of "MM. Burgess et Key," and the ploughs of the "*celèbre* Fowler;" the Marquis de Perales, who proposed "Prosperity to the town of Ipswich," &c. The proceedings were throughout of a very gratifying character.

The *Mining Journal*, in a humorous article on the Patent Office, says, "In the sale department there is a Lord Dundreary diminished, who acts as cashier, and his deputy, two shopmen to wait upon the customers, and two messengers to assist them; and we believe that since the sale of specifications by stamps a seventh assistant has been added to damp the stamps."

A large wrought-iron girder, 74ft. long, 5ft. 8in. high in the centre, and weighing 20 tons, was most successfully removed from Eagle-wharf Road, New North Road, to the Manor Road, Dulwich, by Bray's traction engine, on Friday night. It would have required 25 horses to draw it by the ordinary method. There are many more of these girders to be removed by the same means, they being required to form a bridge at Dulwich, for the London, Chatham, and Dover Railway.

The officers and men of the Royal Engineers at Chatham have been recently occupied in a series of pontooning and diving operations in the Medway, above Rochester bridge, a portion of the river which presents facilities for carrying on operations of this kind. The description of pontoons used on the different occasions of the Royal Engineers being engaged in these duties have been General Blanchard's, in ordinary use by the Sappers and Miners, the newly-invented pontoons by Captain F. Fowke, R.E., the designer of the International Exhibition building, and the ordinary barrel pontoons. The diving apparatus used during the operations was that invented by Mr. Heinké, by the use of which accidents are rendered nearly impossible. At the conclusion of the operations, the pontoon rafts were floated through Rochester bridge to the Pontoon-hard adjoining the Royal Engineers' practising ground.

A Glasgow paper says: — We had the pleasure of witnessing the other day the operation of a new invention for the consumption of smoke, and economising of fuel in furnaces, such as are used in connection with steam boilers, and which has been patented by Messrs. Allan & M'Kiver, of the Hecla Foundry. To consume the smoke a current of intensely heated air enters the furnace, causing combustion of the smoke, which would otherwise escape, effecting thereby an increased production of steam from a given amount of fuel. The tests applied were of the most stringent character, and the results were highly successful. The furnace having been supplied with fresh coal a quantity of smoke issued, such as is emitted from ordinary furnaces, the temporary cover was then removed from the mouth of the patent apparatus, when the smoke diminished, and in less than one minute entirely ceased. The simplicity of the invention is in keeping with the success which has crowned the efforts of the inventors. It must be a gratification to all to know that at last there is a reasonable hope of an end being put to the abominable smoke nuisance, at least in its worst phases, by the use of furnaces on this principle, which is equally applicable to steamers, thus affording, at the same time, a boon to the public in freeing them from the huge volumes of smoke which so often issue from the funnels. It is evident also that this will prove a great advantage to seagoing steamers, seeing that they will require to carry so much less fuel than they, under the present system, are required to do.

The works erected at the breakwater-fort, Plymouth, for constructing the new fort, were destroyed on Monday last. These works consisted of a circle of 170ft. piles with 5ft. iron shoes sunk into the rock round the foundation to form the framework for travelling cranes, by which the blocks of concrete were to be lowered in their places. The works had occupied six months in erection, and were approaching completion. The accident occurred at low water, when about 40ft. of the piles were exposed, and a strong easterly wind was prevailing. The eastern guis and piles first gave way, followed by the whole of the rest, all breaking off at the shoes. The contractors, Messrs. Lee & Son, of London, are said to be heavy losers.

Messrs. Whight & Mann take exception to our description of their sewing machine in last number. Instead of the feed motion being given to the cloth as the needle penetrates it, the revolution of the wheel to which the needle is attached sends it right down before the cloth is moved forward; so that a thick material may be operated on without any risk of breaking the needle.

From the report of the commissioners, issued on Monday, it appears that during the year 1861 3,276 applications were made for provisional protection, 2,047 patents were granted, 2,015 specifications were filed, and 1,229 applications lapsed. The salaries to clerks and officers amounted to 6,573*l*. The fees paid to Sir R. Bethell were 2,238*l*. 12*s*.; to his clerk, 204*l*.; to Sir W. Atherton, as Attorney-General, 2,245*l*. 19*s*.; to his clerk, 203*l*.; to Sir William, as Solicitor-General, 2,320*l*. 10*s*.; to his clerk, 211*l*. 10*s*.; to Sir Roundell Palmer, 2,160*l*. 18*s*.; to his clerk, 195*l*. 15*s*. — total, 9,780*l*. 4*s*. The charge for compensations was 4,584*l*., and for current expenses, 4,153*l*. 18*s*. 1*d*. Printing and stationery cost 16,212*l*. 7*s*. 2*d*.; fuel, 131*l*. 19*s*. 10*d*.; and the Kensington Museum, 1,920*l*. 13*s*. 7*d*. There was thus a surplus income of 36,978*l*. 3*s*. 9*d*., besides a sum of 18,485*l*. for stamp duty.

Mr. Scratchley, the author of the Treatise on Savings' Banks and Banks of Deposit, has issued a proposal for the creation of a "mutual guarantee fund, and for the appointment of a permanent Savings Banks' extension and improvement committee," the object of which is to lay a bill, containing their suggestions and opinions, without delay before the Government in the name of the banks, relative to the creation of a mutual guarantee fund.

It appears an important improvement was introduced during the recent submersion of the additional cable just laid by the Electric and International Telegraph Company from Lowestoft to the Dutch coast. Fishing boats were stationed every five miles to prevent the waste of cable by the "slack" usually attendant on the difficult process of submersion, and a considerable length of wire was thus saved — indeed, it is understood as much as five miles.

A new lighthouse has been placed by the Government of Sweden and Norway in the Gulf of Bothnia. The light will be fixed and visible all round the horizon. There is on board the vessel a large bell, which will be tolled in thick weather.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

The Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

Steam Engines, &c., 367, 377, 390.

Boilers and their Furnaces, &c., 365, 384, 391.

Roads and Vehicles, including railway plant and carriages, saddlery and harness, &c., 380, 393.

Ships and Boats, including their fittings, 372, 373, 382, 383, 397.

Cultivation of the Soil, including agricultural and horticultural implements and machines, 387.

Food and Beverages, including apparatus for preparing food for men and animals, *None.*

Fibrous Fabrics, including machinery for treating fibres, pulp, paper, &c., 363.

Buildings and Building Materials, including sewers, drain-pipes, brick and tile machines, &c. *None.*

Lighting, Heating, and Ventilating, 366, 371, 385, 395.

Furniture and Apparel, including household utensils, time-keepers, jewellery, musical instruments, &c., 368, 369, 376, 379, 381, 386, 389, 392, 396, 398, 399.

Metals, including apparatus for their manufacture, 388.

Chemistry and Photography, &c., *None.*

Electrical Apparatus, &c., *None.*

Warfare, &c., 362, 374, 375, 394.

Letter-Press Printing, &c., *None.*

Miscellaneous, 364, 376, 378.

362. F. J. Bolton. *Improvements in rifle and gun stoppers, and oil bottles.* Dated Feb. 11, 1862.

This invention relates to an improved mode of constructing a rifle or gun stopper of a tubular form, so as to combine in one article a gun or rifle stopper, and an oil bottle with pricker or oil pin. The body of the stopper is made of a metal or other tube of suitable length to contain the oil; the brass head which forms the top of the stopper is made flat, and forms also the bottom of the oil bottle. Metallic tubular stoppers have heretofore been covered externally with cork or some other absorbent material, but the patentee proposes to provide these improved stoppers with a casing or covering of felt, woollen cloth, worsted, or other suitable elastic absorbent substance or fabric, which will hold a small quantity of oil. This covering is also made a little larger than the bore of the gun, so as to admit of compression, and, when in the muzzle, will fit quite tight, and fill up the grooves of rifles, and not be liable to fall out when in use. At the other end of the tube is a female screw, into which is screwed the block which carries the pricker or oil pin, consisting of two, three, or more wires, which are secured in the head or top piece. This latter is also provided with a leather washer to prevent the oil from escaping from the bottle, and running down the barrel of the rifle when the stopper is inserted in the muzzle. The head of the stopper being flat and heavy, forms a bottom for the oil bottle to stand upright upon. When the oil pin is screwed into the tubular case or oil bottle, the stopper is complete, and ready to be placed in the muzzle of the gun or rifle, and the worsted covering which surrounds it being of an elastic nature, will fit tightly therein, and will exclude the air and damp, and, being always kept slightly moist with oil, will prevent the muzzle of the rifle from getting rusty. The oil pin consists of several wires coming to one point, and are placed at slight distances from each other, so as to admit of the capillary attraction taking up a small quantity of oil from the bottle, and holding it suspended until it is applied to any part of the rifle which requires oiling. When the stopper is removed from the muzzle of the rifle, as, for instance, when the latter is in use, the stopper is to be kept in a metal sheath, which may be attached by means of a small strap, or in some other convenient manner, to the leather waist-belt, or some other convenient part of the accoutrements. *Patent completed.*

363. J. Herrington. *Improvements in machinery or apparatus for preparing cotton and other fibrous materials for spinning.* Dated Feb. 11, 1862.

The patentee claims: 1. Fluting or corrugating the ends of the beaters of scutching machines. 2. The use of two cranks for actuating the doffer combs of carding engines, one of such cranks being cast upon the shaft. 3. In carding engines he claims mounting those tops or flats which turn upon hinges, and the apparatus for healing, so that they may be moved bodily. 4. In reference to the drawing frame, he claims the application of two trumpets through which the sliver passes, one of them being employed for the stop motion. Lastly, in the drawing frame, the provision for bearing the trumpet lever in an elevated position. *Patent completed.*

364. G. J. Aman. *Transparent envelopes, bags, or wrappers, and appendages thereto, for holding parcels or samples of grain and other dry substances, chiefly applicable for transmission by post at lower rates of postage.* Dated Feb. 12, 1862.

This invention has for its object the means of transmitting through the post office or parcel offices small parcels of, say, grain, or other dry substances, such as mercantile samples, and so forth, by enclosing the same in transparent envelopes, bags, or wrappers made from tracing paper, tracing cloth, book muslin, gauze, bobbin net, or any other suitable and sufficiently transparent substance that will admit of the contents of the parcels being ascertained by seeing them through their enclosure. These improved envelopes or bags intended to hold grain or similar substances, so as to allow the same to be seen at the post office or parcel offices without opening the envelopes or bags, and to allow the envelopes or bags, or appendages thereto, to be stamped without injuring the contents, are made as follows:—The patentee makes part of each envelope or bag to contain the grain or similar substance of transparent calico or similar substance, and another part he flattens so as to provide a suitable surface on which the address is written and the stamp placed, so as to allow the obliteration of the postage-stamps and the impressing of the post-mark thereon by the post-office officials without fear of injury to the sample or other contents of the packet. Or instead of the last-mentioned part, the address and stamp may be carried on a label to be attached by string and eyelets, or by insertion into the mouth of the bag, which is then tied with string or by any other convenient plan, which allows the bag to be separated from the label. *Patent completed.*

365. F. Tolhausen. *A new system of vertical steam boilers.* (A communication.) Dated Feb. 12, 1862.

These vertical steam boilers are constructed with a view to increasing the heating surface, saving of fuel, and consumption of smoke. The main body of these boilers consists of a cylindrical portion of small diameter occupying the centre of the fire-space, under and around it; this vertical cylinder widens out at about two-thirds of the total height of the boiler into another cylindrical and concentric portion, which is firmly united to the said under cylinder by a bottom having the shape of a truncated cone or frustrum. The two cylinders described forming one single recipient contain the necessary quantity of water for generating steam; they are surrounded with and supported by brickwork, but in such a manner as to leave an annular fire-space all round the lower cylinder, and also around part of the upper cylinder. Through the annular space surrounding the lower cylinder, the patentee carries an annular cylindrical and concentric water-chamber, extending from the fire-box to nearly the truncated cone bottom above mentioned, and bisecting the lower annular space vertically. The flames and gases are thus forced to pass up between the inside of the annular water chamber and the small cylinder of the main body, then strike against the truncated cone bottom, pass round the lower portion of the upper cylinder, and finally escape down along the outside of the annular water chamber into flue or flues. By this mode of conducting the combustible gases and other products of combustion, a great saving of fuel and consumption of smoke is effected. The annular water-chamber is in constant communication with the upper portion of the main body of the boiler by means of elbow pipes passing through the annular fire space. *Patent completed.*

366. J. Robb. *Improvements in ventilating.* Dated Feb. 12, 1862.

This invention consists of certain improvements in ventilating churches, dwelling-houses and other buildings, ships, railway and other carriages, and other places requiring ventilation. The principle which the patentee has adopted in carrying these improvements into effect is that of admitting the necessary supply of fresh air at a low level, and carrying off the heated and vitiated air at a higher level, a continuous movement of the atmosphere being thus kept up, while at the same time all disagreeable or hurtful effects from draught are obviated by the peculiar arrangements which are employed for that purpose. *Patent completed.*

367. J. Brickhill. *Improvements in the cylinders and pistons of steam engines.* Dated Feb. 12, 1862.

The patentee claims: 1, supporting the pistons of steam-engines (having horizontal or inclined cylinders) by means of a friction roller mounted in the lower side of the piston, and working on a parallel key or feather placed in the under side of the same, and capable of adjustment by means of a wedge in the manner and for the purposes set forth; 2, he claims the metallic packing-ring in two parts, capable of being adjusted so as to make it fit tighter to the sides of the cylinder, as set forth; 3, he claims the loose tongue or sliding packing-piece working in a groove in the piston, and acting upon the upper surface of the "feather" or key on the cylinder so as to keep the same steam-tight, whether the same is pressed downwards by means of a spring, or acts merely by its own weight, as described. *Patent completed.*

368. T. Coltman. *Improvements in sewing machines.* Dated Feb. 12, 1862.

This invention has for its object to produce a fast or secure stitch, which is not liable to be drawn out, and which is also an elastic stitch, which cannot be broken by pulling or stretching the cloth or work. This is effected by the use of two needles, one placed above and the other below the cloth. These needles are mounted in guides at an angle to each other, and, by means of cranks or excentrics, are made to move up and down, and pass their points through the cloth alternately; and in so doing the upper needle, for instance, when drawn back, will leave a loop through which the lower needle will pass before entering the cloth. This latter in returning also leaves a loop through which the upper needle, in its turn, will pass before entering the cloth, and so on, each needle alternately passing through the loop formed by the other. The cloth or work is moved forward by means of toothed rings or roughened annular surfaces, which are actuated either by pinions or by friction of contact of elastic surfaces. The needles are arranged to work between these toothed rings or roughened annular surfaces, which therefore will bear on each side of the seam, and keep the work straight and steady.) *Patent completed.*

369. A. Hinshaw. *Improvements in hooped skirts.* (A communication.) Dated Feb. 12, 1862.

This invention consists in making the metal hoops of skirts with joints or hinges in such position that, when the skirt is on the wearer, one set of joints or hinges shall come on one side, and the other on the opposite side. The person wearing a hooped skirt having such joints or hinges is enabled to sit down without the skirt and dress worn over it being raised or tilted up in front, or to pass through narrow doorways, enter carriages, or the like, without inconveniently disturbing the set of the dress. *Patent completed.*

370. R. A. Brooman. *Improvements in preparing and ornamenting cast iron and other metals in order to fit them for articles of furniture and decoration and other uses.* (A communication.) Dated Feb. 12, 1862.

The chief object of this invention is to render cast iron suitable for articles of furniture free from all liability to oxidation, and to ornament it by the application of the colouring and decorative processes used to ornament ceramic wares. In order to apply the ornamentation, it is necessary the metal should receive a preparation—that is, it must be covered by a vitrified varnish, upon which the ornamentation or decoration is applied. The inventor obtains this coating in all colours by employing in a dry state opaque enamels in a proper state of fusibility for spreading over the metal, together with colouring oxides used in vitrifiable colours. By this invention imitations of marble, precious stones, and various woods, are among those obtained on cast iron and other metals. *Patent completed.*

371. J. S. Joseph. *Improvements in coke ovens, and in utilising the waste heat from the same.* Dated Feb. 12, 1862.

The patentee claims: 1, the construction of coke-ovens, having external chambers at the top, and flues leading from these and surrounding the sides and bottom of the oven into which the combustible gases enter, and are there caused to undergo more or less complete combustion by being brought into contact with jets of atmospheric air which enter the said external chambers and flues, other jets of air being also caused to enter the ovens themselves for the same object substantially as described. 2, the employment of the spare heat resulting from the above-described combustion of gases in the improved coke ovens, for generating steam in boilers, for making illuminating gas in retorts, for firing pottery, for heating drying stoves, for calcining ores, and for burning lime. *Patent completed.*

372. T. Spencer. *Improvements in propellers for navigable vessels, and engines for actuating the same, parts of which are applicable to other purposes.* Dated Feb. 12, 1862.

This invention consists of a new form of propelling apparatus for navigable vessels, and a peculiar description of rotary steam engine for actuating the same, which engine is also applicable for other purposes, and the propeller may be used as a substitute for the common under-shot water-wheel. The propeller consists of a number of paddle-floats, each formed with three long narrow leaves or feathers, radiating from the longitudinal face of an axle or common centre, and fixed at an angle of 120° to each other. These paddles the patentee mounts loosely on their longitudinal axis parallel to each other, having their bearings at each end supported on two endless chains, which are stretched out in a horizontal direction and work over pulleys. The outer pair of pulleys he mounts in movable bearings, so that the outer or stern end of the apparatus may be lowered down or elevated at pleasure, according to the load draught of the vessel. This propelling apparatus he places in a well or recess formed in the stern of the vessel to which it is applied. The driving power he uses to actuate the propelling apparatus consists of a rotary steam-engine, having a fixed cylinder consisting of a hollow ring, in which revolves one or more pistons on radial arms springing from a centre transverse shaft, having its axis in the centre of the so formed cylinder. The cylinder is fitted with one, two, or more inlet, and one, two, or more outlet valves. He introduces a sliding diaphragm between each inlet and outlet valve, forming surface-pieces dividing the cylinder, and the sides of which act alternately as an abutting surface for the steam, and to divide it from the exhaust. These sliding diaphragms are actuated from the centre shafts by a cam or excentric motion. The engine he connects to the propelling apparatus by a cog-wheel keyed on to the centre shaft, from which the radial arms carrying the pistons spring, and which gears into a second cog-wheel on the shaft containing the two inner pulleys, over which the endless chains carrying the propeller floats work. *Patent completed.*

373. A. Samuelson. *Improvements in building ships and vessels.* Dated Feb. 12, 1862.

The patentee claims the construction of angular ribs or upright frames of plates rivetted to each other and to angle iron, to which ribs or upright frames the outer plating or skin is fixed by rivetting, and to which ribs or upright frames armour-plating, when used, is also fixed by internal flange, as described. *Patent completed.*

374. T. Horsley. *Improvements in breech-loading fire arms.* Dated Feb. 12, 1862.

This invention has for its object improvements in breech-loading fire arms, and is applicable to that class of fire arms in which the breeches of the barrels are opened to receive cartridges by turning the barrels on a horizontal axis at right angles to their length, so as to raise their breech ends up above the breech plate, which closes them when in a position for firing. In order to lock the barrels in such class of fire arms when the breeches are closed, the patentee employs a bolt or catch, which enters a recess in a lump fixed underneath the barrels at their breech ends, and this bolt or catch is connected to a lever placed in front of the trigger guard, and mounted on a horizontal pin or axis, so that by pressing on the lower end of the lever, the bolt or catch may be withdrawn. In order that the pressure may be conveniently applied to the lever, it has a button attached to its end; the stem of the button passes through a slot in the front of the trigger guard, so that the head of the button is within the guard; here it is very conveniently situated for receiving the pressure of the thumb when it is desired to open the breeches, and it is also protected from accidental pressure. The bolt is constantly forced forward by a spring, and it is made to work with an incline, so that in closing the breeches it is self-acting, as when the projection underneath the barrels comes against it, the incline causes it to recede, and as soon as the notch comes opposite to it the spring throws it forward, and causes it to enter the notch. A similar arrangement may be applied to single barrelled guns. *Patent completed.*

375. W. E. Newton. *Improvements in projectiles.* (A communication.) Dated Feb. 13, 1862.

This consists in inserting within the outer periphery of the projectile anti-friction rollers or wheels placed at an angle to the line of motion of the same. These diagonal wheels, by bearing against the inner surface of the barrel, will cause the projectile to rotate on its axis in the same way as the grooves of rifled ordnance act upon their projectiles. At the rear of the projectile, and behind the anti-friction rollers, a packing is adapted to the projectile, and being fitted on a conical seat, this packing will expand and fill the bore of the gun when the explosive force of the powder acts on it behind, and by this means windage is prevented. *Patent abandoned.*

376. J. S. Joseph. *A retort oven and the utilisation of the spare heat from the same.* Dated Feb. 13, 1862.

This consists in constructing a large retort built up of fire-brick, &c., and surrounded by an outer structure of fire-brick in such a way that a space is left all round the retort, the

ends of the same passing through the ends of the enclosing structure, and being provided with suitable doors. To support the retort, the patentee forms piers of fire-brick underneath the same. He prefers to construct the retort of a catenary, parabolic, or elliptic transverse sectional form. This retort or oven he employs for either making coke, charcoal, or for other similar processes wherein combustible gases are disengaged. At or near the top of the retort he forms suitable openings, through which the combustible gases formed inside the same pass into the surrounding space. He introduces small jets of atmospheric air both into the space between the top of the retort and the surface of the materials inside the same, as also into the space surrounding the retort, and thus causes the more or less complete combustion of the gases, thereby creating an intense heat, which, having access to nearly the whole outer surface of the retort, causes the process which is taking place inside the same to be effected in the most rapid and perfect manner. The hot products of this combustion may be rendered available for many purposes. *Patent completed.*

377. J. PETERS. *Improvements in portable steam engines applicable to locomotive, stationary, and marine engines.* Dated Feb. 13, 1862.

In this engine the cylinder is constructed on the oscillating principle, and is placed within the steam of the boiler. The bearings of the trunnions are fixed on the top of the boiler, and the inlet and exhaust passage, as in all cylinders of this construction, are made in the trunnions, one of which is provided with an exhaust pipe and a valve, whereby the action of the engine may be reversed when required. The piston rod is connected to a crank on the end of the crank shaft, which works in steam-tight stuffing boxes, secured to or fixed on the side of the steam dome. The crank shaft carries a band wheel or driving pulley, whereby motion may be transmitted to any machinery that requires to be driven. A force pump for supplying the boiler with water is also mounted on one side of the boiler, and the piston of this pump is worked by an excentric on the crank shaft. *Patent abandoned.*

378. M. A. F. MENNONS. *Improvements in the disinfection of animal excretions, and in the extraction therefrom of fertilising elements for agricultural purposes.* Dated Feb. 13, 1862.

The apparatus for carrying this invention into effect is not described apart from the drawings. *Patent completed.*

379. W. WILLIAMS. *Improvements in pianofortes.* Dated Feb. 13, 1862.

This relates, 1, to horizontal grand pianofortes, and consists in arranging the strings on the sounding board diagonally, that is, inclining towards the right hand in proceeding from the tuning pins to the back. By this means the length of string in proportion to the length of the case is increased, so that, for a given amount of power, the instrument may be shortened, and its form and general appearance improved, or for a given length of instrument the power may be increased. 2, to horizontal pianofortes generally, and consists in arranging the hammers so that they may be caused to strike down upon their respective strings underneath the back parts of the keys, which communicate with the hoppers for working the hammers, thereby increasing the length of vibratory action of the strings, by allowing the bridge on the rest-plank to be placed under the front parts of the keys, and reversing the action of the hammers. The keys, instead of resting on the key-board, are supported on pieces of wood or metal called "key rests," working on wires as centres of motion supported by the key-board. The front end of each "key rest" has a saw cut in it, which admits of the tightness of the key pin being adjusted by a screw, for giving the required freedom to the key, instead of by enlarging the mortice as usual. *Patent completed.*

380. W. HEWITT. *Improvements in rein holders.* Dated Feb. 13, 1862.

This invention is not described apart from the drawings. *Patent completed.*

381. A. C. EBBUTT. *An improved self-adjusting principle to be applied to reclining, easy, or other chairs.* Dated Feb. 13, 1862.

This consists in lowering or altering the inclination of the back and seat by a wood, or wood and metal, frame, to which the back is fastened, being hinged on the bottom frame of the chair, and on which frame, or rollers attached thereto, rests a hinged seat, and by which arrangement, by the action of a person sitting in the chair, the back and seat may be raised or inclined to any desired position, and retained in such position by means of a spring catch and toothed quadrant, which catch is drawn back by handles conveniently placed at the sides or elsewhere. *Patent completed.*

382. W. H. BROWN. *An improvement in yards, fore and aft booms, and gaffs.* Dated Feb. 13, 1862.

This invention in yards consists in forming the central part of yards of metal and tubular, and in inserting arms of wood into the ends of the tubular centre to complete the yard. The invention in booms and gaffs consists in forming the pents near the mast called the jaws of iron with a socket, into which the patentee fits wooden spars to complete the booms and gaffs. *Patent abandoned.*

383. C. D. ABEL. *Improvements in towing boats and other vessels on rivers, and in apparatus employed for that purpose.* (A communication.) Dated Feb. 13, 1862.

This consists in laying an iron chain along the bed of a river to the extent to which it is required to tow vessels, which chain is made to pass up on board a vessel acting as a tug-boat, at one end of the same, whence it passes over guide pulleys to the middle of the vessel, and is there wound several times round one or more drums fixed on a shaft or shafts connected by gearing to a steam engine, or to steam engines fixed in the boat. After leaving the drum or drums before named, the chain is made to pass over guide pulleys along the deck to the other end of the boat, whence it again descends to the bed of the river. *Patent completed.*

384. T. DAVISON. *Improved means for preventing the corroding of steam boilers.* Dated Feb. 13, 1862.

This consists in introducing into the water a salt or salts, such as the carbonate of soda, potash, or lime, capable of neutralising the corrosive action of the injurious agent present in the water. *Patent completed.*

385. F. FALCONER. *Improvements in lamps.* Dated Feb. 13, 1862.

This consists, according to one modification, in combining a glass globe and chimney in one piece, the lower part whereof may be made to resemble any of the ordinary or ornamental forms of globe, whilst the upper part is contracted in diameter and elongated to act as a chimney; or the globe and chimney may be made in separate pieces, being fitted together in any convenient way, but with the chimney portion not reaching lower than the upper part of the globe, or the top of the flame. *Patent abandoned.*

386. J. F. LAWTON and J. LAWTON. '*Improvements in the manufacture of flannel for shirtings and other articles of apparel.* Dated Feb. 13, 1862.

The objects here are to give increased strength and durability to such flannel, and to obviate or prevent the liability of its shrinking in washing, at the same time that the appearance of the material and the brilliancy of the colours are considerably improved. The invention consists in the combination in flannel for such purposes of silk and wool, the combination which the patentees prefer to use being a woollen warp and a silk weft, but other combinations of silk and wool may be substituted with a similar effect. *Patent completed.*

387. R. HORNSBY, Jun. *Improvements in apparatus for thrashing, elevating, cleansing, and separating grain, and in apparatus for elevating straw.* Dated Feb. 13, 1862.

The details of this invention are too voluminous to be quoted here at sufficient length for an intelligible abstract. *Patent completed.*

388. W. D. ALLEN. *Improvements in the manufacture of stamp heads and beds employed in crushing ores and other mineral substances.* Dated Feb. 13, 1862.

This consists in the manufacture of stamp heads and beds, by founding or casting them in molten steel, which, for this purpose, the patentee prefers to use in a hard or highly carbonised state, or to add to the molten steel as much cast or pig iron as will give the degree of hardness required. *Patent completed.*

389. G. C. BURROWS. *Improvements in lounges, seats, or other apparatus for sitting or reclining on, which improvements are also applicable to rocking-horses.* Dated Feb. 13, 1862.

By these improvements a pleasant gravitating, oscillating, adjusting, or rocking motion is obtained. For this purpose the apparatus is formed of one or more triangles, resting each on one line or angle of or between each of such triangles. These lines form fulcra, on which the triangles (which are the legs) may turn, whilst other parts may also rest on the frame of the apparatus, or against each other, and at such point of rest they may be connected by elastic or other suitable means. The parts may also be connected by their opposite upper surfaces. Upon anyone reclining on either end of the apparatus, when made up of more than one triangle, the tendency of such part is to separate from the other end; this tendency is controlled and counteracted by the connections, by which a gravitating, oscillating, or rocking motion is obtained, and which may be assisted by springs. The apparatus may have castors or other wheels, and is applicable to, or in substitution of, rocking-horses. *Patent completed.*

390. E. E. ALLEN and J. STEWART. *Improvements in the construction of steam engines.* Dated Feb. 13, 1862.

This invention is not described apart from the drawings. *Patent completed.*

391. J. E. M'CONNELL. *Improvements in parts of boilers and furnaces for locomotive and other engines.* Dated Feb. 13, 1862.

This consists: 1. In making the upper surfaces of the fire bars of a convex form, in lieu of straight, so as to leave an increased bulk of metal towards the middle of the bar, where the fire acts more fiercely upon it, thus strengthening the bar at the most advantageous part, and still enabling it to be made generally lighter than the ordinary ones. The inventor disposes the bars transversely in the furnace. 2. In lining the tubes of steam generators with zinc, spelter, or other hard metal. *Patent abandoned.*

392. E. GREEN and J. NEWMAN. *Certain improvements in buttons for fastening and ornamenting articles of dress.* Dated Feb. 13, 1862.

This relates, under one modification, to linen buttons, and consists in raising circular or other forms on the front of the button to indicate where the perforations are in the metal forming the bottom of the button. *Patent completed.*

393. J. E. M'CONNELL. *Improvements in railway breaks and in warming railway carriages.* Dated Feb. 13, 1862.

This relates to that system of railway breaks wherein the breaks are applied simultaneously to any or all of the carriages in the train, and consists in the use of a force pump fixed on any convenient part of the train, and worked either by the guard or other person, or by excentrics on the axle of the tender or van, for forcing air or water into a pipe or pipes extending along the entire train, and connected at suitable intervals with horizontal cylinders placed between the pairs of wheels in each carriage, such cylinders having pistons or plungers, which, on being forced outwards by the action of the force pump, will apply the break blocks directly to the wheels or axles simultaneously throughout the whole train. *Patent completed.*

394. A. JANSEN. *A new ball for fire-arms.* Dated Feb. 13, 1862.

This ball is made of lead, and is of a cylindro-conical form. The point or conical part of the projectile is solid, but at the cylindrical part two or more deep grooves are cut round the projectile, leaving corresponding flanges. The point or front end of the projectile will, consequently, be the heaviest, and upon the explosive force of gunpowder acting against the flat rear end, the cylindrical part will be crushed or crowded up against the forward end, and in so doing will be made to expand and fill the bore and grooves of the rifle. *Patent abandoned.*

395. W. G. VALENTIN. *An improved mode of and apparatus for coking coal.* Dated Feb. 13, 1862.

This consists in submitting the coal to the coking operation in a close vessel or retort of a peculiar kind, and also in heating the retort by the combustible gas evolved from the coal during the coking operation. *Patent completed.*

396. S. B. WHITFIELD. *Improvements in the manufacture of iron bedsteads, and in the manufacture of ornamental iron tubes or columns for the construction and ornamentation of iron bedsteads.* Dated Feb. 14, 1862.

This consists in the use of parts made of stamped or pressed iron, the said parts being joined to the other parts by junctions of cast-iron cast in metal moulds, that is, by the process known as chill casting, or by rivetting, or otherwise. The parts which the patentee principally makes of stamped or pressed sheet iron are parts of the pillars and head and foot rails. The manner in which this part of the invention is to be carried into effect may be illustrated with reference to the foot rail of an iron bedstead. *Patent completed.*

397. A. J. DODSON. *An improved composition for coating, covering, or protecting ships' bottoms, applicable also for coating or covering railway sleepers, telegraphic wires, and other surfaces, and likewise as a cement and as a substitute for metal for certain constructive purposes.* Dated Feb. 14, 1862.

This composition is formed by combining pulverised slate with vegetable or mineral pitch. *Patent abandoned.*

398. W. CLARK. *Improvements in mounting and fixing the handles or knobs of doors, furniture, and other articles.* (A communication.) Dated Feb. 14, 1862.

This relates to handles, knobs, &c., formed of glass, crystal, or other fusible siliceous material, and consists in securing the spindle in a recess formed in the interior of such knob, the pin for fastening the knob being carried by the mounting, which affords greater strength and prevents the mounting becoming loose. *Patent abandoned.*

399. T. D. M'FARLANE. *Improvements in sewing machines.* Dated Feb. 14, 1862.

This invention is not described apart from the drawings. *Patent completed.*

PROVISIONAL PROTECTIONS.

Dated April 15, 1862.

1090. T. W. Gray, 114 Fenchurch Street. Improvements in the manufacture of explosive compounds. (A communication.)

Dated April 21, 1862.

1153. E. H. C. Monckton, Esq., Thurloe Place, South Kensington. Improvements in the preparation of metal to be used in the construction of cannon, rifles, armour plates, and other objects used in naval or military warfare or otherwise.

Dated April 22, 1862.

1167. E. H. C. Monckton, Esq., Thurloe Place, South Kensington. Improvements in umbrellas, parasols, awnings, tents, and covering cloths, and in waterproofing the same.

Dated April 23, 1862.

1184. A. Hodgkinson, Glenville Bleach Works, Belfast. A mixture of composition to be used in the process of boiling, preparing, or bleaching vegetable substances, whether they are in the manufactured or unmanufactured state, which mixture may also be used in the manufacture of soap.

Dated June 13, 1862.

1766. J. Robinson, Rochdale, timber merchant. Improvements in machinery or apparatus for sawing wood.

Dated June 28, 1862.

1902. J. Petrie, Rochdale, engineer. Improvements in slide valves for steam engines.

Dated July 15, 1862.

2032. E. Draper and E. Thomas, Birmingham. A new or improved method of strengthening wooden shutters and doors.

Dated July 18, 1862.

2051. J. Willcock, 89 Chancery Lane, consulting engineer. A new ornamental fabric, and the machinery for producing the same. (A communication.)

2053. F. L. Stott, Rochdale, machine maker. Improvements applicable to mechanism or apparatus for warping yarns or threads.

Dated July 22, 1862.

2083. R. Grogan, 22 Westbourne Gardens, Bayswater. Improvements in screw propellers of steam vessels, and in the arrangement thereof.

Dated July 23, 1862.

2093. C. J. Keene, 10 Shrewsbury Villas, Bayswater. A new or improved winding apparatus for raising and lowering canvass on easels.

2095. E. K. Dutton, Stretford, Lancashire, mechanical draughtsman. Certain improvements in steam engines.

2097. W. Clark, 53 Chancery Lane, engineer. Improvements in the manufacture of manure. (A communication.)

2099. R. Bell, Esq., Westland Row, Dublin. Improvements in the manufacture of bricks. (A communication.)

Dated July 24, 1862.

2101. J. Dickson, 66 Tollington Road, Holloway, gentleman. Improvements in treating copper ores and solutions of copper to obtain copper therefrom.

2103. W. Clissold, Dudbridge, Gloucestershire, engineer. An improved mode of manufacturing cylinders.

2105. T. Lemaistre, 3 Rue de Grammont, Paris, architect. Improvements in privies.

2107. W. H. Perkin, Seymour Villa, Sudbury. Improvements in printing and dyeing when aniline and analogous coal-tar dyes are employed, also in preparing colouring matters. (A communication.)

Dated July 25, 1862.

2111. J. Redgate, Sneinton, Nottinghamshire, lace manufacturer, and H. Redgate, Stoney Street, Nottingham, lace manufacturer. Improvements in machinery or apparatus for the manufacture of fabrics on bobbin net or twist lace machines.

2113. P. Robertson, Glasgow, merchant. Improvements in producing brushing or frictional surfaces.

2115. J. Seymour, Queenstown, wine and spirit merchant, and D. G. Hatcher, Southampton, yacht builder. Improvements in steering ships and in apparatus for the same.

2117. V. Manzini, Modena, Italy, engineer. Certain improvements in the construction of locomotive engines used on railways for facilitating and controlling the ascent and descent of locomotive engines and trains on inclined planes of lines of railway, and for simplifying the construction of locomotives used on railways.

2119. A. Lahousse, Lupus Street, Pimlico, mechanician. An improved construction of railway wheel.

Dated July 26, 1862.

2121. T. Sagar, machinist, and J. Rocliff, Burnley, Lancashire, moulder. Improvements in moulding.

2123. W. Clark, 53 Chancery Lane, engineer. Improvements in obtaining or extracting silver from ores and other bodies, and in apparatus for the same. (A communication.)

2125. T. Long, 2 Clarendon Place, Notting Hill, house decorator. Improvements in the manufacture of open metal work, applicable to various useful purposes.

Dated July 28, 1862.

2130. W. Spence, 50 Chancery Lane. Improvements in the preparation of a red colouring matter. (A communication.)

2131. P. S. Devlan, Commercial Foundry, Commercial Street, Manchester, engineer. Certain improvements in the manufacture of telegraphic cables.

2132. W. Spence, 50 Chancery Lane. Improvements in the preparation of a blue colouring matter. (A communication.)

2135. T. Cook, Manor Place, Walworth, machinist. Improvements in apparatus employed in the manufacture of envelopes.

2137. J. Fourdrinier, Grove Terrace, Peckham, gentleman. Improvements in apparatus for removing knots from pulp.

2139. F. Selby, Surbiton, Surrey, engineer. Improvements in surface condensers.

2141. E. Burnett, Ashford, Kent, coach builder. An improved combined cart and sleigh.

2143. C. W. Siemens, 3 Great George Street, Westminster. Improvements in gas engines.

Dated July 29, 1862.

2145. Z. Colburn, 15 Tavistock Street, Bedford Square, mechanical engineer. Improvements in steam pumping engines.

2147. A. Boyle, Birmingham, tool maker, and T. Warwick, Birmingham, machinist. Improvements in the manufacture f the ribs and stretchers of umbrellas and parasols and in machinery to be employed in the said manufacture.

2149. P. S. Devlan, Commercial Foundry, Commercial Street, Manchester, engineer. An improved composition to be employed for covering projectiles and the internal and external surfaces of vessels, which is also applicable to the manufacture of tubing and to other useful and ornamental purposes.

2151. C. T. Burgess, Brentford, Essex, engineer. An improved stand for beer and other casks.

2153. J. Mapple, 2 Newman's Place, Kentish Town, and D. Mapple, 3 Queen's Road, Homerton New Town, telegraph and clock makers. Improvements in telegraphic apparatus.

2155. M. Henry, 84 Fleet Street. Improvements in obtaining fibrous materials and paper pulp, in treating, cleansing, and scouring fibrous materials and fabrics manufactured thereof, in producing soap for the said operations, and in obtaining products from liquors used therein. (A communication.)

Dated July 30, 1862.

2159. J. Hyde and J. Hyde, Bradbury, engineers. Certain improvements in governors for steam engines, water wheels, mills, and for other similar purposes.

2163. J. Benyon, Swinton, manager. Certain improvements in looms for weaving.

2165. W. Clark, 53 Chancery Lane, engineer. Improvements in gas burners. (A communication.)

2169. J. W. Woodford, Sutherland Street, Walworth. Improvements in machinery for raising or forcing water.

Dated July 31, 1862.

2171. W. Weild, Manchester, engineer. Improvements in machines for cutting, shaping, rolling, drilling, screwing, milling, and fluting metals.

2173. C. Bedells, Leicester. Improvements in the manufacture of braces.

2175. A. V. Newton, 66 Chancery Lane, mechanical draughtsman. Improved machinery for planing metal. (A communication.)

Dated August 1, 1862.

2177. J. List, Carisbrooke. An improved means of and instruments for obtaining distances and heights, and distances between distant objects, without computation.

2179. D. T Lee, Birmingham, manufacturer. An improvement or improvements in ornamenting surfaces of wood and of papier mâché.

2181. G. A. Biddell, Ipswich, mechanical engineer. Improvements in railway crossings.

2187. T. G. Webb, Manchester, glass manufacturer. Improvements in the manufacture of flint glass.

Dated August 2, 1862.

2189. J. Briggs, Blackley, Lancashire, engraver and manufacturer. Improvements in the manufacture of belts, webs, braids, tapes, laces, and other similar articles produced by weaving, plaiting, or twisting.

2193. G. Coles, Gresham Street West, merchant, and J. A. Jaques, chemist, and J. A. Fanshawe, engineer, Tottenham. Improvements in the manufacture of grinding and polishing tools and surfaces.

Dated August 4, 1862.

2194. A. & E. M. Denny, Waterford, Ireland, merchants. Improvements in the manufacture of bacon.

Dated August 5, 1862.

2195. S. Simon, Tuilerie Street, Hackney Road. An improvement in ornamenting ladies' and children's slippers.

2198. J. Townsend, Glasgow, manufacturing chemist. Improvements in damping cotton and other fibrous materials and fabrics, in preserving the same from mildew, and in preserving size or stiffening from decomposition.

2199. W. Clark, 53 Chancery Lane, engineer. Improvements in the purification of water and in apparatus employed therein. (A communication.)

2201. J. R. Nicholl, Streatham, Surrey, clerk. Improved means of, and apparatus for, utilising and disposing of the sewage of towns and villages.

Dated August 6, 1862.

2203. W. W. Burdon, Esq., Newcastle-upon-Tyne. Improvements in reducing wood fibres to pulp.

2205. M. C. Sinibaldi, 1 South Villas, South Street, Greenwich. Improvements in the manufacture of chains, and in the apparatus employed therein.

2207. F. Nauheim, Cecil Street, Mile End Road, boot maker. An improvement in the ornamenting of boots, shoes, and goloshes.

Dated August 8, 1862.

2222. J. Whipp, Rochdale, jeweller. An improved arrangement of apparatus and means for cleaning articles of ornament and jewellery.

2224. R. A. Brooman, 166 Fleet Street, patent agent. Improvements in repeating firearms. (A communication.)

2226. E. Humphrys, Deptford, engineer. Improvements in steam engines.

Dated August 9, 1862.

2230. G. Haseltine, 100 Fleet Street, American barrister-at-law. Improvements in carriage wheels. (A communication.)

2234. A. J. Moreau, chymist, and A. E. Ragon, gentleman, Bernard Street, Russell Square. Improvements in the manufacture of gas and coke.

Dated August 11, 1862.

2238. H. Fenton, Queen's Ferry, Lancashire, wire drawer and wire rope manufacturer, and W. Stubbs, Liverpool. Improvements in telegraph wires.

2240. J. Goodfellow, Blackburn, engineer. Improvements in steam or water engines.

2242. W. Clark, 53 Chancery Lane, engineer. An improved carriage for conveying sugar moulds in sugar refineries. (A communication.)

2246. W. E. Gedge, 11 Wellington Street, Strand. Improvements in the construction of ladders. (A communication.)

2248. H. Donald, Renfrew, engineer. Improvements in machinery for shearing, punching, and riveting metals.

2250. R. Gresty, Packington Street, Islington. Improvements in scarfs or cravats.

Dated August 12, 1862.

2254. J. Dickson, 66 Tollington Road, Holloway, Middlesex, gentleman. Improvements in treating ores and solutions of lead to obtain lead therefrom.

2258. C. M. Westmacott, 42 Noble Street. Improvements in cements.

2262. C. Sengry, 54 Great Queen Street, Lincoln's Inn Fields, manufacturer and importer. An improved smoking pipe, which may also be adapted as a tube for smoking cigars.

2264. J. Bower, Carlow. Improvements in railway sleepers.

Dated August 13, 1862.

2266. J. Dickson, 66 Tollington Road, Holloway, Middlesex, gentleman. Improvements in obtaining sodium from certain sources of that metal.

2270. C. W. Smith, W. Mould, Belmont, S. Cook, and W. H. Hacking, Bury, machinists. Improvements in looms for weaving.

2272. J. Peters, Wouldham Hall, Rochester. An improved hydraulic cement.

2274. G. Turner, Woolwich Dockyard, master shipwright. Improvements in fastening armour plates of ships.

2276. L. Galli, Lucca, Tuscany. Improvements in apparatus for propelling vessels.

2278. J. H. Johnson, 47 Lincoln's Inn Fields, gentleman. Improvements in carts and other vehicles. (A communication.)

Dated August 14, 1862.

2282. J. Key and E. Hoskins, Birmingham, metallic bedstead manufacturers. An improvement or improvements in the manufacture of plain and ornamental metallic pillars for bedsteads, cots, couches, tables, and other like purposes.

2284. C. E. Wilson, Monkwell Street, manufacturer. An improvement in buckle fastenings for braces and belts.

2288. H. R. Passey and L. Niman, 17 Little Newport Street, Leicester Square. An improved cigar tube or holder.

2290. W. J. Curtis, Tuffnell Park Road, Holloway. An improved mode of, and apparatus for, ascertaining the fares and earnings of public vehicles.

2294. W. B. Herapath, 32 Old Market Street, Bristol, physician and consulting chemist. Improvements in decolorising solutions of sugar, and also vegetable juices containing sugar.

2296. W. B. Herapath, 32 Old Market Street, Bristol, physician and consulting chemist. Improvements in treating crystallisable sugar to render it more suitable for fermentation and conversion into alcohol and vinegar.

Dated August 15, 1862.

2302. T. F. Kirby, Aldersgate Street, merchant tailor. Improvements in garments for gentlemen and ladies' wear.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2298. M. A. F. Mennons, 24 Rue du Mont Thabor, Paris. An improved apparatus for the production of sealing wax impressions. (A communication.) *Dated August 15, 1862.*

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

1080. T. H. Bennett. Manufacture of hats.
1085. G. Bedson. Manufacture of wire ropes.
1090. T. W. Gray. Manufacture of explosive compounds. (A communication.)
1096. T. Edwards and J. Harrison. Letter receiving boxes.
1100. D. Stott. Manufacture of rings from paper, millboard, or pasteboard.
1106. W. J. Marsden. Eye-shades.
1120. W. Harling, J. M. Todd, and T. Harling. Looms.
1125. J. L. Perin. Machinery for mortising wood.
1136. R. Dennison. Reaping and mowing machines.
1142. B. Rhodes. Manufacture of cylinders, tubes, and other vessels from paper.
1150. H. Lumley. Rudder.
1159. R. A. Brooman. Jackets or protectors for covering metal and other surfaces to prevent loss of heat by radiation. (A communication.)
1161. T. Attwood. Kitcheners.
1167. E. H. C. Monckton. Umbrellas and parasols.
1174. R. Boby. Rolling or crushing land.
1184. A. Hodgkinson. A mixture of composition to be used in the process of boiling, preparing, or bleaching vegetable substances.
1186. G. T. Bousfield. Elliptic springs for wheel carriages and other purposes. (A communication.)
1188. W. E. Newton. Fertilising composition. (A communication.)
1201. F. Dangerfield. Lithographic or zincographic presses.
1202. R. Mushet. Lining, repairing, or "fettling" of puddling furnaces.
1203. J. Offord. Carriages.
1221. W. Fisken. Cultivating land by means of steam power.
1229. E. Alcan. Carding engines. (A communication.)
1243. R. Vaile. Propellers.
1253. J. Ross. Grinding stones. (A communication.)
1262. W. E. Newton. Mowing and reaping machines. (A communication).
1263. M. Henry. Aerating liquids. (A communication.)
1289. C. P. A. Douchairn. Apparatus for letting in or shutting off water or other liquids.
1373. J. M'Can. Drying, cooling, and cleaning grain.
1376. W. Riddle. Hydraulic and other presses.
1414. H. W. Sambridge. Sliding chandeliers, gasaliers, and other pendent lamps.
1506. F. E. Sickels. Steering vessels.
1507. J. C. Gore. Belt shippers.
1529. H. B. Barlow. Presses for cotton. (A communication.)
1606. R. A. Brooman. Manufacture of looped or knitted fabrics. (A communication.)
1699. P. M. Parsons. Ordnance.
2039. W. Henson and W. W. Clay. Knitting machinery.
2057. C. A. Day and T. Summers. Sheer legs.
2078. S. & J. Lord. Carding engines.
2093. C. J. Keene. Winding apparatus.
2097. W. Clark. Manufacture of manure. (A communication.)
2105. T. Lemaistre. Privies.
2111. J. & H. Redgate. Manufacture of fabrics.
2113. P. Robertson. Producing brushing or frictional surfaces.
2162. W. Wanklyn. Opening and conditioning tightly compressed cottons.
2189. J. Briggs. Manufacture of belts.
2226. E. Humphrys. Steam engines.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed August 22, 1862.

471. W. H. Ross.
472. J. Kirkwood.
473. A. Bornemann.
476. C. H. J. W. M. Liebmann.
480. G. Blakey, S. Blakey, J. Blakey, and B. White.
482. R. Foster.
485. W. Johnston.
488. J. C. Haddan.
489. R. Waller.
495. L. Davis and F. M. Parkes.
497. F. St. G. Smith.
502. J. Piddington.
504. E. Bliss and H. Lamplough.
506. T. Watson and R. Dracup.
512. C. Kingsford.
514. H. W. Cook.
516. A. Green.
517. A. Stephen.
523. T. King and R. Varvill.
524. J. Cliff.
526. C. L. Knoll.
529. W. P. Savage.
530. J. Medhurst.
531. J. Smith.
532. G. Torr.
533. T. Adams.
536. W. Smith.
538. Sir C. T. Bright.
541. J. R. Foster.
542. W. S. Wood.
543. J. Revell.
544. P. D. Azemar.
545. W. H. Muntz.
546. A. W. Makinson and W. F. Batho.
552. J. Parker.
554. T. Bradford.
682. L. Vidie.
690. S. V. Bonneterre, C. T. Erhart, and J. F. Monti.
744. T. Myers.
863. W. A. Ashe.
866. E. T. Noualhier.
957. L. Lindley and F. Taylor.
1020. E. Funnell.
1084. A. V. Newton.
1124. G. T. Bousfield.
1189. W. E. Newton.
1231. S. & G. Cheavin.
1248. J. E. A. Gwynne.
1610. J. Critchley.
1618. R. Griffiths.
1733. J. G. Appold.
1850. J. Taylor.
1886. J. Lord and J. Brown.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1905. W. T Henley.
1914. G. W. Petter and T. D. Galpin.
1915. W. A. Vérel.
1944. M. J. Stark.
1917. J. J. O. Taylor.
1970. J. H. Johnson.
1958. E. Rettig.
1933. J. Henry and J. E. H. Andrew.
1950. C. Hanson.

PATENTS ON WHICH THE SEVENTH YEAR'S STAMP DUTY HAS BEEN PAID.

1877. A. Savage.
1921. C. Schlickeysen.

LIST OF SPECIFICATIONS PUBLISHED

During the Week ending August 23, 1862.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s. d.		s. d.		s. d.		s. d.		s. d		s. d.
80	2 6	109	0 4	120	0 4	131	0 8	142	0 4	153	0 6
91	0 8	110	0 4	121	0 4	132	0 8	143	0 6	154	0 4
100	0 4	111	0 4	122	0 4	133	0 4	144	0 10	155	0 8
101	0 4	112	0 4	123	0 4	134	0 4	145	0 8	156	1 6
102	0 8	113	1 6	124	0 4	135	0 10	146	0 8	157	0 8
103	0 4	114	1 0	125	0 10	136	0 4	147	0 4	158	0 6
104	0 4	115	0 8	126	0 4	137	1 10	148	0 4	159	0 10
105	0 4	116	1 6	127	0 8	138	1 6	149	0 4	160	0 8
106	0 8	117	0 4	128	0 4	139	0 4	150	0 4	...	...
107	1 8	118	0 8	129	3 6	140	0 10	151	0 8	...	...
108	0 10	119	0 6	130	0 10	141	0 4	152	0 4	...	...

Note.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, SEPTEMBER 5, 1862.

THE INTERNATIONAL EXHIBITION.

Iron, Hardware, &c.

Among the treasures of the Eastern Transept it would be unfair to omit noticing one of the most conspicuous, and, in some senses, one of the most important, trophies, namely, that of Mr. Bessemer. The taste which induced that gentleman to select as the medium for exhibiting specimens of his iron and steel, a polished mahogany stand, more in keeping with the fitments of a modern gin palace than appropriate to the use to which it is applied, may be questioned; but there can be no question about the value of the materials which the stand serves to display. In every variety of form, and in every process of its manufacture, the Bessemer iron and steel are shown in the Eastern Transept, and their adaptability to innumerable purposes is developed. It is not necessary here to enumerate the articles exhibited, nor to enter into the particulars of the remarkable and yet simple processes by which the conversion of crude iron into steel of the Bessemer kind is effected. It may be stated, nevertheless, that many and severe were the testings to which the substance was exposed, before it was admitted into the favour of those who were predisposed to the use of steel produced by the old, and time-honoured system. The extreme toughness of the Bessemer iron was proved by the bending of a cold bar of 3in. square, under the hammer, and into a close fold, without the smallest perceptible rupture of the metal at any part; and the bar was thus extended on the outside of the bend from 12in. to 16¼in., and was pressed on the inside from 12in. to 7¼in., thus showing a difference in length of 9½in. between what, before bending, were the two parallel sides of a bar 3in. square. Again, an iron cable, consisting of four strands of round iron 1½in. in diameter, was, while cold, so closely twisted as to cause the strands at the point of contact to become permanently embedded into each other. Each of these strands had become elongated to 12½in. in a length of 4ft., and had diminished one-tenth of an inch in diameter throughout their whole length.

Steel bars, of 2in. square and 2ft. 6in. in length, were twisted cold into a spiral, the angles of which were about 45°; and some round bars, 2in. in diameter, were bent cold under the hammer, into the form of an ordinary horse-shoe magnet, the outside of the bend measuring 5in. more than the inside. The steel and iron boiler plates, left without shearing, and with their ends bent over cold, afforded ample evidence, too, of the extreme tenacity and toughness of the metal; while the clear, even surface of railway axles and pieces of malleable iron ordnance, were examples of the perfect freedom from cracks, flaws, or hard veins. The tensile strength of this metal was not less remarkable. The several samples of steel tested in the Proving Machine at Woolwich Arsenal bore, according to the reports of Colonel Eardley Wilmot, R.A., a strain varying from 150,000lbs. to 160,900lbs. on the square inch. Four samples of iron boiler-plate similarly tested, bore from 68,314lbs. to 73,100lbs.; while, according to the published experiments of Mr. W. Fairbairn, Staffordshire plates bore only 45,000lbs., and Low Moor and Bowling plates a mean of 57,120lbs. per square inch. Of course, the cost of production of the materials was considerably less than that of the plates put into competition with Mr. Bessemer's; and here another advantage of no slight consequence is evident.

Leaving now the Bessemer stand, or trophy, let us enter what is known as the South Court, and which extends westward from the Eastern Transept, nearly to the Central Avenue. Here, indeed, is a perfect *embarras du richesse* in the way of iron and hardware, and the difficulty is where to commence our notice of the principal gems in detail. In the way of ecclesiastical wrought metal work, the new rood screen for Hereford Cathedral, designed by Mr. G. G. Scott, R.A., and executed by the Skidmore Art Manufactures Company strikes the eye. It consists of an open arcade of five arches, each of which is divided by a central shaft, whilst the head of the arch is filled by geometrical tracery. It is an elegant work, alike creditable to the taste and skill of the designer, and to the workmanship of the company to whom its execution was intrusted. The judicious combination of polished brass and wrought iron work produces a highly contrasted and yet harmonious effect. Such structures, indeed, go to prove that Art is revivifying amongst us, and form a counterpoise to some abortions which might be named, and in which realisation has by no means justified conception. The Norwich gates, and those of the Coalbrookdale Company, are both excellent specimens of workmanship; but as they have already obtained, on all sides, a fair modicum of admiring criticism, we leave them for the present, and turn to subjects of a less striking and grand, but not less useful character. Of these, as we have seen, there is abundance. We pass on through the Sheffield Court, wherein Messrs. Cammel, Messrs. Rodgers, Turton & Sons, Turton Brothers, and sundry firms of nearly equal eminence, are great in the cutlery and edge tool way, and reaching the Wolverhampton Court, are attracted by the show of Messrs. Lambert & Sons, of Walsall, Staffordshire, and Lambeth. Although the actual display made by this well-known house is not so meretricious as some of those in its immediate neighbourhood, yet it speaks eloquently of the nature of the works, in which they excel. The Messrs. Lambert are, indeed, justly celebrated for their contributions to what may be termed sanitary engineering. Almost every appliance of a mechanical nature which can be conceived in reference to this important branch of the engineer's occupation has, apparently, been produced by this firm. To catalogue them all would, indeed, be an impossibility.

The high-pressure valve cocks manufactured by Lambert & Sons are especially valued on account of their simplicity, durability, and cheapness. In almost all cities and towns at home, where the constant-supply system prevails, these are used, and so they are at Amsterdam, Copenhagen, Bombay, and other cities abroad. In the way of cast-iron sluice valves or main cocks, few manufacturers are able to excel those in question, and that known as the "improved sluice or steam valve" (Underhay's patent) is remarkable for its efficiency and usefulness. The novelty in the construction of this valve consists in the introduction of loose-faced plates with an elastic substance behind them, and the main advantages gained by it are:—1st, that perfect contact between the slide and gun-metal fans is secured under all circumstances. 2nd, that the faces may be taken out for repair without removing the body of the valve or breaking the joints. 3rd, that the cup with screw, nut, and stuffing-box, can all be removed for cleaning or repair, leaving the slide closed. This renders the shutting of any other valves on the main unnecessary. In fact, this valve does seem to be free almost from imperfection, and its inventor is entitled to a considerable amount of praise for having designed so thoroughly practical a contrivance. In the way of pumps and hydraulic apparatus, the Messrs. Lambert are well represented at the Exhibition, and so they are in respect to locomotive boiler tubes, wrought-iron tubes for general purposes, steam cocks, &c.

Before leaving the Wolverhampton division of the South Court, it may not be unadvisable to look at what has been done since 1851 in the matter of fire-proof safes; and conspicuous in this branch are several admirable specimens shown by Mr. Price, who, by the way, makes, in his published circular, some very sensible and truthful remarks on the subject. That gentleman states, that "at the period of the "former Exhibition few real improvements "in the construction of iron safes and locks "had been introduced, and, as a consequence, "there was little deserving of commendation "in the former class, whilst in the latter the "best locks of the most eminent makers were "openly picked with ease. No medal was "awarded for iron safes, and in the Gilbart "Prize Essay on practical banking, Mr. Granville Sharp, in his article on safes, says:— "'It must, however, be observed that the "'safes of the Great Exhibition (of 1851), as "'a whole, are distinguished rather by orna- "'ment and beautiful workmanship than by "'strength and practical utility for banking "'purposes; they are too small, too handsome, "'and too costly.'"

Mr. Price appears to have profited by the shortcomings of 1851, and in 1862 he has been fortunate enough to have awarded to him a medal for safes and locks. Mr. E. B. Denison, no mean authority on the subject of locks and safes, had previously expressed a very high opinion of those of Mr. Price, and pointed out the practical points of superiority by which he considered them distinguished.

Messrs. Bramah, Hobbs, Ashley, & Co., and Mr. Chubb, are the other leviathans in the lock and safe department of the International Show, and they well sustain the reputation they had, long previous to its opening, achieved.

The number of Birmingham exhibitors in the South Court is prodigious, and the variety of articles exhibited by them interminable. Certainly, if *excess* of human ingenuity be a possibility, the Birmingham exhibitors possess it. Nothing is above or below the reach of their inventive minds, and their skilful fingers realise with marvellous effect the conceptions of their active brains. If we were but to commence an enumeration of the products of their mechanical talent, we should not know when or where to put a period to it. It is necessary, however, to think of bringing our remarks upon iron and hardware to a conclusion for this week, and this we will do by a quotation from the poetical (?) circular of one of the exhibitors in the South Court. It has been our fate to meet occasionally with some strange productions of the poetic muse, but never, we believe, with anything so outrageous as the following:—

And now the Anthems of the wondering bard
Swell o'er the name of W. Poupard.
'Neath a bushel long was light of Science hid,
But now the world-famed Patent Safety Skid
Sheds the bright radiance far abroad,
From 257 Blackfriars Road. (!)

We forbear to transcribe more of this wondrous effusion, lest the consequences to our readers might be serious, and we seriously advise "W. Poupard," in mercy, to stay the distribution of such nonsense.

The skid referred to appears to be well adapted for its purpose, and its proprietor might allow it to rest upon its own merits rather than make himself ridiculous by the publication of such trash as the above.

Mr. Poupard, in addition to his "World-"famed Patent Safety Skid," is, it appears, also the proprietor of the "Patent Curvilinear Beam "and Paracentrical Wharf Machine," whatever that may be.

NEW COINAGE FOR HONG-KONG.

We learn with much satisfaction that it is the intention of the British Government to cause a new and distinctive coinage to be struck for the flourishing, and populous colony of Hong-Kong. The metallic currency of that place has hitherto consisted of as strange and heterogeneous a collection of coins as could possibly be imagined, and the confusion and mystification arising from this state of things are intolerable in the highest degree. Spanish and Mexican dollars are intermingled with pieces of money from almost every part of the world, and the miserable specimens of Chinese mintage, known as "cash," serve to make the jumble more complete. It is in consequence of strong representations from the colonial authorities at Hong-Kong of the evils and annoyances arising from this serious defect in the currency, that the Home Government has determined to remodel it. Much care will have to be exercised, no doubt, in the introduction of a new coinage, because a very large proportion of the inhabitants consists of Chinese, and their habits and prejudices must, to a certain extent, be respected. It will not be possible to wean the "Celestials" all at once from their ancient notions of monetary matters, or to familiarise them easily with our own views of pounds, shillings, and pence. Any transition, indeed, will have to be made gradually, and without shock to the feelings of John Chinaman. We believe that the Duke of Newcastle, in his official capacity of Colonial Secretary, has fully considered the difficulties which will have to be surmounted in effecting the proposed change, and the plan of operations proposed by him seems to be well calculated for overcoming the practical and moral obstacles in its way.

It is intended that the dollar shall for the present remain the unit of value, and that the new coins shall comprise divisions of that unit. The subsidiary coins will be named, respectively, ten-cent pieces, which will be of silver, one-cent pieces, of bronze, and, for the purpose of humouring the Chinese, British "cash" pieces, or mils, which will be composed of copper. The first-named coin of the series will be equal in value to the half-franc of the French Empire; the second to the cent of America; and the third, or British cash, will be equal in value to the one-thousandth part of the dollar. It may seem strange that coins of so small a value as this last—less, indeed, than the fourth of a farthing—should seem necessary; but the innumerable variety of articles which, in the markets, shops, and street stalls of Hong-Kong, are fixed at the price of a single cash, is at once a justification of this proceeding, and a proof of its necessity. The last census of the colony demonstrated the fact that there were 120,000 Chinese resident in it, and as these from their childhood have been accustomed to the use of the "cash," it has been deemed prudent to supersede the rough native coin of that name by a well finished and handsome specimen of English mintage. The preservation of the name will, it is hoped, reconcile the Chinese to the modification. It is, perhaps, scarcely essential to inform our readers that the "cash" of the "Celestial" empire is simply a thin disc of gun-metal, ornamented by hieroglyphics, which has been cast in moulds—not struck from dies—and having a small square hole through its centre. The diameter of the cash, and its weight, have been varied by different Emperors, as have the Chinese characters which are supposed to decorate it. These inequalities have not lessened the annoyances arising from the mixture of coins circulating at Hong-Kong.

In the proposed new British "cash" there will, of course, be uniformity of size, weight, and diameter. The hole through the centre of the coin will be retained, as almost all Chinamen prefer stringing their money like beads round their necks, to carrying it like "outer barbarians," in their pockets. The hole, however, will be a round one, of about an eighth of an inch in diameter, and whether this arrangement will square with the views of our pig-tailed friends remains to be discovered. It certainly will prevent the coin bearing the image of Queen Victoria, although its being a round hole instead of a square one will obviously facilitate the process of coining the British cash pieces at the Mint. The designs for the new cash pieces are simple but not inelegant. On what may be termed the obverse side there will appear the words, in English, Hong-Kong, One Cash, with the date 1862; on the reverse the same inscription will be given in Chinese characters. The first instalment of British cash transmitted to the colony will comprise, we are told, no less than twenty millions of coins.

As regards the ten-cent pieces, they will be slightly smaller in size than the sixpence. The obverse will exhibit the profile of Her Majesty, with a suitable superscription, and the reverse will consist of a wreath enclosing the words Ten Cents, Hong-Kong, and the date 1862. The devices ornamenting the one-cent bronze piece will resemble those on the cash, and like that piece it will be perforated for doing duty as part of a necklace. The first coinages of ten-cent and one-cent pieces will consist, respectively, of 100,000 and 1,000,000 coins. It is presumed that the introduction of the three varieties of coin named will be attended with some little trouble, but a Royal Proclamation legalising them, carefully drawn up both in the English and Chinese languages, and widely published throughout the island of Hong-Kong, will smooth the way and lighten the labours of the Governor in accomplishing the praiseworthy task.

That the Chinese are not unwilling to adopt new systems which commend themselves to their good sense has been clearly demonstrated in the colony by their patronage of the Chartered Banks established there. The notes issued by those banks are taken without hesitation, and indeed are cashed freely in the province of Kwang-tung, seventy or eighty miles above Canton, by native bankers, and at a charge of not more than one-tenth per cent. This at least is a hopeful sign, and it leads to the supposition that, in due time, other reforms may be accepted by the Chinese, provided they be instituted and carried out in good faith, and with a proper deference for their time-honoured, though rather exceptional, manners and customs. It is probable, indeed, that the British Government will gain "golden "opinions" from both the native and foreign residents of Hong-Kong, once the new coinage shall have found its way into the creeks and channels of general circulation, and thus proves its superiority to the clumsy and inconvenient currency which at present stops the way.

COMBINED RAILWAY AND CARRIAGE TRAFFIC BRIDGE ACROSS THE HOOGHLY.

For very many years the idea of throwing a bridge across the Hooghly has occupied the attention of engineers, and of the inhabitants generally of Calcutta. The magnitude, and, consequently, large expense of such a work, have prevented hitherto its accomplishment. At length, there does appear, however, a chance of the difficulties in the way of the prosecution of the enterprise being overridden. What the necessities of the half million of people who occupy the metropolis of British India could not effect, the railway companies are likely, and that very soon, to carry out. The site of the proposed bridge, it is true, is not precisely that which the residents of the city would have chosen; but, nevertheless, the structure will be of immense value to them, and they will look forward with anxiety and pleasure to the time of its completion. Some sixteen miles above Calcutta, the Grand Trunk Road crosses the Hooghly at the Pulta Ghaut, and then approaches and enters Calcutta through the fine avenue known as the Barrackpore Road. Half a mile above this, the river narrows from its average breadth, of nearly three-quarters of a mile, to 2,300 feet. At this spot, moreover, two lines of railway—the Eastern Bengal, and the East Indian—which run almost parallel for eighteen miles on either bank of the Hooghly, approach to within four miles of each other. The banks of the river at this point are high and stiff, and a series of experiments have proved that there is a good foundation in its channel. Here, then, it has occurred to the railway companies in question, is the best place for making a junction between the two lines. All the circumstances are comparatively favourable. Beginning at the surface of the water, there is an average depth of 16 or 17 feet at the lowest tides. The river flows over a bed of fine quicksand 28 feet in thickness, which covers another bed of solid clay 28 feet thick, and this, again, rests upon an old deposit of brown sand.

In and upon the bed of clay, it is proposed by Mr. Turnbull, Chief Engineer of the East Indian Railway, to lay the foundations of the bridge; but as the extreme rise of the tide, from the lowest in the dry season to the highest during the floods, is 21 feet, it follows that the surface of this bed of clay is 65 feet below high-water mark. The pressure likely to be exerted by the water on the piers and abutments, may be gathered from the fact that the tide frequently rushes up at the rate of 5¼ miles per hour, the lowest velocity of the current being 3½ miles, at half ebb. Mr. Turnbull has recommended a suspension girder bridge, with spans of 400 feet. The success of such a bridge on a large scale was first demonstrated in 1855 by Mr. Roebling, who constructed one above the Niagara Falls. The Niagara bridge has a clear span of 281 feet, with suspended stiffening girders of timber work. Though this bridge has now been open for traffic for seven years, and, on the average, thirty trains per day pass over it, it is as firm and sound as when first erected, and possibly even more so. The engineer of the East Indian Railway fixes his spans at 400 feet for the sake of economy, and for the purpose of

minimising interference with the navigation of the river.

The estimated expense of the piers is very heavy, and this arises from the fact that the cylinders must be sunk to a great depth in order to obviate danger from "scouring," and consequent deepening of the river. The suspended girder principle is preferred to the tubular girder, from a desire to lessen the weight upon the foundations. The Conway Tubular Bridge is, we are informed by Mr. Turnbull, of 400 feet span also, but its weight is 1,300 tons, whereas the weight of one span of the proposed structure will be only 550 tons, including the suspending chains and stiffening girders. Calculations, and the experience of the Niagara bridge, go to prove that, under these conditions, there would be no fear of undulations or serious deflection from passing loads.

The Hooghly Railway Bridge will, if Mr. Turnbull's plans be accepted—and of this there is little doubt—consist of lattice girders supported by chains. On the top of the girders there will be a common roadway; the lower joists or floor of the girders will carry a single line of rails. The strength of the chains will be such that they will sustain their own weight, that of the girders, and a train of 400 tons, with no greater strain than 5 tons upon the square inch. The undulation of the roadway with a train of 400 tons is not likely to exceed 2½in., which is less than the deflection of the Menai Tubular Bridge. The deflection of the girder under its own weight will be sufficient to compensate for the sinking caused by the lengthening of the chains from increase of temperature, and thus to insure that it will always be in contact with, and be supported by, the chains when the weight comes upon it. The object of the mode of construction proposed is not to produce a perfectly rigid roadway, which, indeed, is next to impracticable, but to take advantage of the great superiority of the suspension principle, by which the tensile power of the iron is alone brought into action at the same time that the only defect in the suspension bridge—namely, its undulation—is corrected by the stiffened roadway.

The bridge will be half a mile in length, with five whole spans of 400ft. each, and two half spans of 200ft. It will be approached on either side from the railway by inclines of 3½ miles, and the gradients will not be greater than 1ft. in 300ft. Between the suspension rods below there will be a width of 14ft. for the passage of trains, and above this a width of 20ft. for ordinary carriage and pedestrian traffic. To permit the passage of the largest river steam-boats with lowered funnels, there will be a clear distance of 25ft. between the bridge and the water.

We do not exactly see how the carriage roadway on the top of the bridge is to be approached, but probably that is a matter of detail which has been well considered and provided for. The total estimated cost of the structure is 280,000*l.*, and 64,000*l.* is set down as the expense of forming the four miles of connecting railway. Messrs. Brassey & Wythes, the contractors for the Eastern Bengal Railway, have signified their willingness to accept the works on these terms. It seems tolerably certain, that if this bridge be erected, the whole of the traffic of Northern India will cross the Hooghly at a point some four miles above the quaint old Danish town of Serampore, and enter Calcutta at Sealdah. We have said that the site of the new bridge is not precisely that which is most palatable to the residents in Calcutta, but we see no impossibility, at some future time, in that city being connected by an ordinary traffic bridge with its opposite neighbour, Howrah. The width of the Hooghly at Calcutta offers no insurmountable barrier to such a work, and British engineering talent, we feel assured, would easily surmount all other difficulties in the way of its accomplishment.

"TEMPLETON'S PRACTICAL ASSISTANT."*

THE second edition of this useful little volume has been issued under the following circumstances:—The author, who has spent nearly ten years in foreign countries, found, on his return from abroad, where no such works were to be had, his little treatises, published more than thirty years ago, still in demand, and it occurred to him to issue a new edition, embodying in a concise form the results of his long practice in various parts of the world. This he has now done, so far as the present book is concerned, which is a perfect *vade mecum* for all who are practically engaged in mechanical pursuits. As a work of elementary instruction in those calculations with which every mechanic should be familiar, it is replete with invaluable information, whilst as a book of "useful reference for those who are "of necessity compelled to give a ready answer "to any mechanical or engineering question," it is a little gem. It can be conveniently carried in the pocket, and contains, in 106 clearly-printed pages, the pith of what is ordinarily to be found only by consulting special large and expensive volumes. The work contains an introduction to decimal arithmetic; tables of decimal equivalents and approximates, and specific gravities; the weights of square, round, and flat bar iron in avoirdupois; of balls, nuts, bolts, and threads; the various properties of metals; the cutting of screws and construction of wheels; some very valuable information on steam and the steam-engine, with tables and rules; the properties of the circle, sundry useful tables on general matters; and a copious index, which may be extended at the will of anyone using the book by the employment of some ruled blank leaves, which are bound up at the end. So much varied information compressed into so small a space, and published at a price which places it within the reach of the humblest mechanic, cannot fail to command the sale which it deserves.

SUBMARINE TELEGRAPHS.

IT is now twelve years ago since the first prominent undertaking in connection with submarine telegraphy startled the scientific world. This enterprise, which had for its object the connection of England with France by means of a subaqueous conductor across the Channel between Dover and Calais, was but the forerunner of numerous other schemes which have, with few exceptions, been eminently successful. Since then, a submarine telegraph company has been formed, which has been conducted by its enterprising directors with more than ordinary success.

The report presented at the half-yearly meeting of the company last week contained some important features, which will be of interest to our readers. It commences by congratulating the shareholders upon the clear accounts "which fully justified the directors in the confidence which they had always expressed in the great resources and value of the property." It appears that the receipts exhibit an increase of 1,330*l.* 16*s.* over the previous year. Some idea of the extent of the business of the company may be obtained from the fact that during the six months ending June last, no fewer than 137,714 messages had been transmitted over their wires, which was in money value an increase over the preceding six months of about 1,398*l.* 4*s.*, while the working expenses have been reduced. But the returns of the current half-year are reported to be more favourable, being an increase over the corresponding period of last year of more than fourteen thousand messages. And out of the receipts of the company the directors are enabled to grant a dividend of 3 per cent. per annum for the last half year, besides handing over a balance of 620*l.* to be carried to the credit of the next account.

It appears that all the cables of the company are at present in good working order; their repair, however, though very heavy, had been less by about 2,000*l.* than the previous year. The repair of cables, indeed, will doubtless be always a considerable item in the expenditure of the company, as cables are often liable to get out of order. In an interesting speech which the chairman gave, in moving the adoption of the report, he mentioned the fact, that when their Ostend cable was broken in two, their engineer was able to restore it in nine days for 261*l.*, which he considered to be very encouraging, as showing that an accident to a submarine cable did not always necessitate a heavy outlay. It appears that the British and Irish Magnetic Company, with whose lines the wires of the submarine cables were united, have extended their system to Bristol and the south-west district of England and Wales. From this extension the company anticipate a considerable amount of continental traffic, which will secure them a more adequate portion of profit for the much greater risk incurred by their submarine lines. One of the most interesting features of the report was the refunding to the company by the French Government the caution money which they had retained, to guarantee the due performance of the concession in respect of the efficient working of the Dieppe cable. This cable, which was the first laid, had been, it appears, purchased by the company when it was in financial difficulties, and under pressure from the French Government, that it should be laid within a certain time. Notwithstanding these depressing circumstances, the company have found it to turn out better than it appears they had anticipated; and it was now in perfect working order. The last, but not least, item of favourable intelligence with which the report abounded was, that "the traffic was likely to improve, as the Italian Government were about laying down a submarine cable between the southernmost point of Sardinia and Marsala, so that the long delays which occurred to telegraphs, while being transmitted over the central Indian lines, would be avoided."

The increase of the business of this company might be attributed to the International Exhibition; but this the chairman denied. He said, indeed, that he believed very little came from that source, though they had opened an office outside that building, which was doing a steady business. The company had not been able to obtain an office inside the Exhibition, as the commissioners had granted the exclusive monopoly to the Electric Telegraph Company. This the directors have every right to consider as unfair and exclusive. The increase of business seems to have been the fruit of the gradual and steady development of telegraphy on the Continent, and the encouraging manner in which they had been treated by the French and Belgian Governments; and from the speeches which were given at the half-yearly meeting, there seems to be an anticipation, which we earnestly hope may be realised, of an increase of business to such an extent that the most sanguine of the shareholders had not anticipated.

* The Engineer, Millwright, and Machinist's Practical Assistant. By William Templeton, Author of "The Operative Mechanic's Workshop Companion." 2nd edition. Lockwood & Co. London.

THE INTERNATIONAL EXHIBITION.

Class I.—Smelting Ores.

(Concluded from page 117.)

We have not discovered in the present Exhibition anything remarkable or novel respecting tin. The usual tin-stone, which is impure peroxide of tin, will be found in the British department from Cornwall, in the Indian, in the Portuguese, and in that of Victoria, No. 479. The specimens in the last but one will no doubt attract the notice of interested persons, who will find numerous details concerning their mode of occurrence, &c., in the Portuguese catalogue, Nos. 34, 37, 7, 30. In 1860 Cornwall and Devon produced 10,500 tons of tin ore, which yielded 6,700 tons of metallic tin—(*Mineral Statistics*, 1861). In the metallurgy of this metal there is nothing either new or important. Michell and Co., of Marazion, Cornwall, exhibit an excellent model of the usual reverberatory smelting furnace, and a series of the products obtained (No. 226). These gentlemen have nothing to gain by their contribution, except the thanks of the public, to which they are justly entitled. Mr. Oxland displays a series of specimens illustrative of his method of separating wolfram from tin ores (No. 258), similar to that which he placed in the Exhibition of 1851. In the Zollverein are ingots of tin from Altenberg (No. 2,301), and this is the only contribution which the kingdom of Saxony has condescended to make! On referring to Dufrénoy's report of Class I. in the Exhibition of 1851, we find the following passage:—"Saxony and the Harz, those cradles of mining, which for so long in Europe enjoyed the honour of possessing mining schools, have sent none of their products." Saxony no longer occupies the proud position of former times. There are other cradles besides hers in Europe, and if, in a spirit of exclusive self-sufficiency, she chooses to keep aloof, let her do so, and the world will progress without her. Tin and Saxony will, perhaps, henceforth be coupled in a sense of unenviable notoriety.

Lead may be quickly despatched. Galena occurs in nearly all the departments of the present Exhibition—namely, Great Britain, Sweden, the Zollverein, Austria, Belgium, France, Spain, Portugal, Italy, Canada, Newfoundland, Venezuela, Australia, &c. In 1860 about 90,000 tons of lead ore are reported to have been raised in Great Britain, from which were extracted 64,000 tons of lead, and 550,000 ounces of silver (*Mineral Statistics*, 1861). In the Swedish department is lead ore from Sala (No. 80 c), which, though of the largely crystalline character, contains considerably more than 100 ounces of silver per ton of lead. Many of the specimens in the Zollverein department, especially relating to the dressing of lead ores, are worthy of examination, but none require particular mention, except Nos. 789, 847. Under these numbers is shown a collection of specimens illustrative of, perhaps, the most remarkable and extensive deposits of galena in Rhenish Prussia. The galena occurs in small rounded shot-like particles, diffused through a bed of white Bunter sandstone, which sometimes attains a thickness of not less than 120 feet. The Italian and Portuguese departments should be carefully inspected with reference to their lead-producing capabilities.

There is nothing of particular interest in the Exhibition relating to the metallurgy of lead. We see many of the usual illustrations, which, though always interesting, yet do not require special comment. The best series in the British department is unquestionably that exhibited by Mr. Sopwith, on the part of Mr. Beaumont, whose name is so well known in connection with lead mining in England (No. 334). The processes of dressing and smelting are illustrated as well as they can be; and Mr. Sopwith, moreover, has added an excellent mining plan. The entire absence of some of the great lead smelters is to be regretted; for, although they can hardly expect to reap any pecuniary advantage from a representation in the Exhibition, yet they might contribute something, if solely with a view to the honour and glory of Old England. In the Zollverein and Italian departments are several interesting series in illustration of dressing and smelting; and among those in the last-named we may specially refer to the products obtained in smelting old slags. Considerable sums have been realised in this country and Spain from such slags, and it is well to keep a sharp look-out for their occurrence in districts where lead-smelting is known to have been practised in ancient times. Barker, Rawson, & Co., Sheffield, exhibit lead decopperised by processes exactly similar in principle to the two methods invented by Pattinson and Parkes respectively for the desilverisation of lead (No. 10). In the same case are shown pigs of lead obtained from slag lead by heating with nitrate of soda. These pigs are stated to be of remarkable purity, notwithstanding they present a bright and highly crystallised surface, which has hitherto been regarded as an unequivocal sign of impurity. We heard a lead-smelter of some experience pronounce them at first sight to be made from slag lead, on account of their crystalline surface; and so they were. But the character of the surface is probably due to the fact of the solidification of the metal under a well-melted flux. There is nothing in the Exhibition to indicate that progress has been made towards the solution of the great problem of condensing lead fume. In the last Exhibition the Duke of Buccleuch exhibited a model of a condenser which he had adopted for the purpose. Are our great smelters doomed for ever to witness the melancholy spectacle of the daily escape of enormous quantities of lead from their chimneys? We refer, of course, to those smelters whose works are in localities where it would be impossible to construct horizontal flues a mile or two in length, as in Derbyshire and the North of England. Bishop Watson, in his admirable *Chemical Essays*, has given an account of the origin of these flues; and, as the subject is now particularly interesting in reference to Lord Derby's proposed legislation on "noxious vapours," we subjoin an extract or two. After stating, with becoming modesty and good sense, that he is aware "that what may appear very feasible in theory, or may even answer in small assays, may not be practicable in large works," the good Bishop proceeds as follows:—

> The first alteration which I would propose to the consideration of the lead-smelters is to substitute a horizontal chimney, of 200 or 300 yards in length, in the place of the perpendicular one now in use. . . . . [The smelters were all] of opinion that the plan I had proposed for saving the sublimate was a very rational one. But so difficult is it to wean artists from their ancient ways of operating that I question very much whether any of them would ever have adopted the plan they approved, if a horizontal chimney which was built a little time ago in *Middleton-dale*, for a quite different purpose, had not given them a full proof of the practicability of saving the sublimate of lead, which is lost in the ordinary method of smelting. This chimney was built on the side of a hill, to prevent some adjoining pastures from being injured by the smoke of the furnace. It not only answers that end, but it is found also to collect considerable quantities of the lead, which is sublimed during the smelting of the ore; this sublimed lead is of a whitish cast, and is sold to the painters at ten or twelve pounds a ton.—(Vol. iii. p. 282, 1782.)

The general reader will have an idea of the prodigious amount of lead which may thus be saved, when he is informed that in one year a large smelting establishment in the north of England obtained 800 tons of lead from the dust accumulated in their long flues! Expedients of various kinds, some of them costly, have been tried with a view to the complete condensation of lead fume; but there is not one which is in all respects satisfactory.

Arsenic, so far as Class I. is concerned, is sufficiently represented in the Exhibition. This metal is rarely employed in the metallic state, and is required in the arts chiefly in the state of arsenious acid, which is commonly called white arsenic, or simply arsenic. This poisonous substance is produced on a very large scale in metallurgical works, either as a primary or as an accessory product. It generally occurs in commerce in the state of white powder, which is prepared by grinding arsenical glass previously obtained. When first produced this beautiful substance is colourless and perfectly transparent: but, like barley-sugar, it becomes opaque on keeping. Arsenic enters into the composition of numerous pigments, and has of late been extensively employed, in the state of arsenic acid, in the preparation of rosaniline, or the so-called Magenta colours. We have pleasure, however, in assuring our fair readers that not a trace of this poisonous metal is retained in these beautiful colours. White arsenic is used for seed steeping, and is frequently sold, under certain restrictions, for poisoning—*of course only rats!* In metallic combination arsenic plays an important function in certain metallurgical operations, and we may probably frighten our readers when we inform them that we could point to chimneys in populous districts in England which have unceasingly vomited forth arsenic by the ton during these last twenty years! And, so far as we know, not a single case of injury to man or beast has occurred in consequence. For obvious reasons we decline to excite unnecessary alarm by naming localities. When the skin is much exposed to contact with arsenic, it is liable to eruptions of a particularly disagreeable character. The dare-devilism of the men employed in arsenic works is really surprising, and in proof of this we will narrate our experience of a visit to large arsenic works not long ago. We received the most courteous attention from the manager, a man of middle age, the very picture of exuberant health and quiet contentment. After we had entered his office, with a view to our instruction, he seized a big lump of arsenical glass and gave it a thundering blow, which scattered it in innumerable fragments about the room, nearly every one of which would have sufficed to destroy human life. "We think nothing about it," says our friend. "But don't you ever suffer?" "Oh, yes, occasionally, but we vomit and think no more about it." "What as to the eruptions on the skin?" "Arsenical—look at my neck, you see the remains of it." So we did. We then went to the furnaces, where the first object to attract attention was a sickly-looking man, who might have been mistaken for a miller. The arsenious acid condenses on the interior of long flues, forming a beautiful white crystalline incrustation, and this is detached through numerous side doors. "We find the best way to do this," said our guide, "is to put a towel round the face and mouth, and stop up the nostrils with cotton wool." The grinding of the solid lumps o arsenical glass *dry* between millstones, and the subsequent packing of the powder also *dry* in casks, is nasty work, as may well be imagined.

Garland, of Redruth, No. 114, and Jennings & Co., of Swansea, No. 169, send instructive collections illustrative of the manufacture of white arsenic; and if we have omitted to mention other exhibitors of these articles, it is accidental, as we did not notice, on our visit to Class I., any marked differences between the arsenical collections exhibited. In the Zollverein department there are two collections, Nos. 821 and 783. The former is from the old Reichenstein Works, in Lower Silesia. The ore is arsenical iron, which is slightly auriferous, and it is from the ferruginous residues that gold was first extracted on a large scale by chlorine water. The second is fr m Breslau, Silesia. Both collections include red and yellow, in addition to white arsenical glass.

We now arrive at the consideration of a metal which has only recently become an important object of manufacture—namely nickel. The word is German, and in the sense in which it has been adopted, as the specific name of this metal, it indicates a worthless and meretricious character. Its chief ore, from its reddish colour and deceitful appearance, is called by the Germans Kupfernickel, which is commonly translated "false copper." According to the recent researches of Deville, pure nickel is malleable and ductile, and has a much higher tenacity than wrought iron. What say you to this, Sir William Armstrong and Mr. Whitworth? It is not yet employed in the state of pure metal, though we have known small horseshoe shaped castings of nickel made solely with the view of evading a particular patent, in which the use of articles of a similar shape in iron had been claimed. Another example of the wisdom of our patent laws! Nickel is used as a constituent of alloys, generally with the object of communi-

cating *whiteness.* German silver—a name, by the way, which our Teutonic brethren indignantly repudiate — is a triple alloy of copper, nickel, and zinc. It might, in fact, be properly called white brass; but there is a good deal in a name, even among metals, and if it had been thus christened there is no knowing what its fate might have been. It was introduced about thirty years ago, especially as a substitute for silver forks and spoons, and a precious substitute it was! To compare the German silver of that time with silver in respect of colour was absurd, and when handled it evolved the disagreeable odour of copper or brass. In process of time an improved article, having really an argentine colour and susceptible of a fine polish, was produced; still with respect to odour it was rankly coppery as before, and so it ever will be. The manufacture became established in Birmingham, and the firm which is unquestionably entitled to the credit of having effected the greatest improvements, and brought it to its present state of perfection, is the well-known one of Evans & Askin. The last-named partner died in Norway in 1847, and it was he who had charge of the manufacturing department. Some time about 1840 the then new process of depositing metals by the agency of voltaic electricity attracted attention in Birmingham, and Messrs. Elkington & Co. obtained patents for plating on this principle. German silver was just the alloy required for silver plating. From its greater hardness it was much better able to resist wear than copper or brass, and it had the additional advantage of being white—so that, if the silver deposit should in the course of time be worn off the ends of forks, &c., the metal exposed would hardly be detected, the reverse of which is the case in similar circumstances with the copper articles silver-plated by the old method. We have all seen those shabby would-be genteel old candlesticks and waiters at inns, on the surface of which it was difficult to say whether silver or copper most prevailed. German silver was adopted by the silver electro-platers, and the German silver trade was at once established on a solid basis, and it has since acquired considerable developement. Nickel has fluctuated considerably in price during the last twenty years. It is now extensively employed in monetary coinage. The Swiss were the first to adopt it, and introduced a quadruple alloy, consisting of copper, nickel, zinc, and silver — an alloy against which, if space permitted, we might urge grave objections. Nickel is now used in the coinage of Belgium and the United States, and possibly in other countries also. The Master of the Mint, it is well known, proposed to employ it in our new copper coinage, but the Chancellor of the Exchequer, Mr. Gladstone, put his veto on the proposition, for reasons probably more satisfactory to himself than to anybody else. Birmingham is solely entitled to the credit of having brought the nickel manufacture to its present perfection.

We may here record a fact of interest to the manufacturing public, and which we have never seen published. The late Mr. Alexander Wright, a surgeon of Birmingham, discovered the value of cyanides of potassium and sodium as solvents for silver in electro-plating. The application was immediately patented, and the patent was afterwards purchased by Messrs. Elkington & Co. This application has proved of immense value to the electro-plater in every respect. Mr. Wright was led to this important invention from reading a passage in *Scheele's Chemical Essays* (pp. 405, London, 1786). So much for old books. At first, Mr. Wright received a royalty of 1*s.* on every ounce of silver deposited; but after his decease, which took place not long afterwards, a different arrangement was made with his widow. There is also another incident which deserves to be recorded, as it has now particular significancy in this time of patent law amendment agitation. The late Mr. Woolrych obtained a patent for the application of the voltaic current from the magneto-electric machine to the plating of metals; but then came the question of solvents, for Messrs. Elkington & Co. had not only secured the cyanides, but had obtained a patent in which Dr. Leeson had specified some 400 solvents. (A.D. 1842, No. 9,374.) It so happened that certain salts were not included in this list, because it was supposed that they could not be employed for the purpose — namely, the alkaline sulphites. Mr. Woolrych luckily found that this was an error, and claimed the use of these identical salts in his patent. Subsequently the patent of Mr. Woolrych became the property first of Mr. Evans, of the firm of Evans & Askin, and afterwards of Messrs. Elkington & Co. It is not improbable that, considering the skill, energy, and taste which this firm has displayed, and which are universally acknowledged, they would have attained equal success without having been nursed in a hotbed of monopoly.

Ores of nickel are exhibited by the manufacturers of German silver. Nickel has been found in small quantity in Cornwall. It has been largely produced in Hungary. In the Zollverein department nickel ores will be met with under the following numbers — 801, 786, 704, 619, 620. Magnetic iron pyrites, containing nickel, has been found in numerous localities during the last few years, and has been largely worked at Espedal, in Norway, by Evans & Askin, who have, however, abandoned this establishment. It occurs in Argyllshire, on the property of the Duke of Argyll. Specimens of such pyrites will be found in the Norwegian department, under Nos. 3, 13, 15. A large mass of similar pyrites is in the Italian collection, No. 66. The ore, we believe, is smelted on the spot, and the regulus obtained is sent to Belgium, where it is refined near Liége. It is singular that this species of iron pyrites should so frequently contain nickel.

Evans & Askin make an excellent display of their nickel and German silver, No. 100. There is a large ingot of nickel which a few years ago would have been regarded as a marvel, and well do we remember the time when it was considered an achievement to fuse a bit of nickel scarcely larger than a pea. Mr. Vivian established nickel works at Swansea a few years ago, and through the Swansea local committee exhibits the products of his manufacture, which, so far as inspection will enable us to judge, leave nothing to be desired. Those who are interested in nickel may study the following collections in the Zollverein department: — From Iserlohn, by Dr. Fleittman, No. 717; from the Mansfeld Copper Works, Eisleben, No. 786; and from Dillenburg, Nassau, Nos. 620 and 619. In the Swedish department is shown an alloy of copper and nickel in powder, which is stated to be a metallurgical product, No. 80; nickel and smelting products from Smaland, No. 37; and an alloy of nickel and iron, No. 5, of which we have not succeeded in obtaining the history.

Next in order comes cobalt. This is a metal which, chemically speaking, is very closely allied to nickel, but in some respects is widely different. Both metals are frequently associated in nature — so much so, that when one is present in an ore the other is usually looked for. It is not employed in the metallic state. In the state of protoxide it is the base of various well-known blue pigments of the highest importance in the arts, especially those of pottery and glass making. Its chief value is due to its property of forming beautiful blue colours when in combination with silica and potass; but it also yields blue colours when combined with certain other elements. Smalts is only the fine powder of a glass coloured with cobalt. This pigment was formerly the only one used in communicating a blue tint to ordinary writing paper; but it has been generally superseded by the cheaper material known as artificial ultramarine. It is still employed to produce the blue tint of starch. The Government works in Saxony once enjoyed a monopoly in the manufacture of this article[1]; but not so now-a-days. The preparation of smalts is always described in metallurgical works, and should, therefore, belong to Class I.; but it is excluded from that class in the present, as it was also in the last Exhibition, and so we dismiss it from consideration. Oxide of cobalt is now largely prepared for the use of the potter and glassmaker in Birmingham, where the manufacture was first introduced about twenty years ago, by Evans & Askin. The separation of nickel from cobalt was at one time regarded as a difficult problem, even n he laboratory of analytical chymists; but the late Mr. Askin was so fortunate as to discover a process by which the separation might be economically effected on the large scale. The ores which they were accustomed to employ in the production of nickel frequently contained cobalt, and, as the presence of cobalt in German silver is injurious, it was desirable to eliminate it on this account alone. By Mr. Askin's process it was obtained as oxide practically pure, and this oxide, which at first was virtually a *waste product*, was for some time sold to the potters at two guineas a pound! The present price is about one-fourth of that sum. Hence, as may be readily supposed, a considerable fortune was speedily amassed. The fine "flowing blue" on our china, which attracted much attention some years ago, was the result of the first application of this oxide. Two oxides are now articles of commerce — namely, the *black* or requioxide, and the *prepared* or protoxide. As secrets will out, so the firm of Evans & Askin were not long allowed to enjoy their monopoly undisturbed, and rival manufacturers started into existence, some of whom failed utterly in carrying out the process. We have seen the name of Louyet, a deceased Belgian chemist, coupled with this new process, as though he had been the inventor! He had no more to do with it than the man in the moon! He visited Birmingham and inspected one of the rival establishments above-mentioned, with the manager of which he was on terms of intimacy, and subsequently published what he had seen, whether with or without authority we do not know. We have availed ourselves of this opportunity of vindicating the claim of our countryman, Askin, as the inventor of the process in question.

Cobalt has only been sparingly met with in this country. Ores specially of cobalt will be found in the Zollverein department, under No. 811. They also occur in the United States and the western part of South America. Saxony might have sent specimens.

In 1860 cobalt ore was imported into England to the amount of 341 tons, and of the declared value of 13,895*l.*; and nickel ore to the amount of 14,000 tons, of which the value is not given (*Mineral Statistics*, 1861). The nickel ore, doubtless, contained a considerable quantity of cobalt.

Messrs. Evans & Askin show the products of their manufacture. Mr. Vivian also shows his; but among the latter we do not observe any specimen of "printers' blue," an article which, at one time, was largely produced for the potters' use by the first-named firm, by whom, indeed, a sample is now exhibited. — *The Times.*

THE TRUE PRINCIPLES OF AIR NAVIGATION EXPLAINED.

TO THE EDITOR OF "THE MECHANICS' MAGAZINE."

LETTER 3.

SIR,—Of the three principles, the most difficult one to contend with has ever been

THE MOTIVE POWER.

By carefully preparing a composition capable of supporting combustion gradually and uniformly in closed chambers, we may obtain by far the most economical and energetic motive power possible, because by the use of such composition its conversion into gaseous matter can be obtained by more compact mechanism than that required for any other controllable prime mover. For not only can we secure the whole of its gaseous matter, but by surrounding the combustion chambers with water the whole of the heat evolved during combustion is rendered also available by the generation of steam; and thus both the steam and gaseous matter collected in the steam space of the generating cylinder combines to produce the impelling force. To obtain an adequate conception of the relative value of this force we must compare the volume of gaseous matter and vapour evolved by equal quantities of gunpowder, water, and coals, and this composition, under the atmospheric pressure.

Grains, troy.		Volume of gas or vapour.
1	of the finest gunpowder (Hall's)	10 cubic in.
1·1	of water and coals (·1 gr. coals)	6·5 ,,
1	of composition, exclusive of water* . . .	3·2 ,,

The time required to convert these substances respectively into aeriform matter should also be taken into account; but as the conversion of any quantity of gunpowder would be instantaneous, and that of water dependent on the evaporating surface, that of the composition may be as quick or slow as we please; so that any comparison would be useless.

The great expansive force of gunpowder is entirely due to the liberation of the gases at a luminous heat, and the velocity of radiation of such heat being much less than the velocity of expansion of the gases. For if we overpower the instantaneous liberation of these gases, and consequently the velocity of expansion, we have these effects reversed; *i. e.* the radiation of the heat has the greatest velocity, and the expansion or liberation of the gases the least velocity. If we ignite a grain weight of gunpowder under a weighted piston, the keenest eye cannot follow the velocity of expansion, and the heat evolved, though intense, will scarcely increase the temperature of the cylinder. If, on the other hand, we ignite a similar quantity of composition under the same weighted piston, the eye can easily perceive the velocity of expansion, and the heat evolved will considerably increase the temperature of the cylinder. It is therefore probable that the same quantity of heat is evolved from equal quantities of these substances during their combustion, but in very different quantities of time; that of powder very suddenly, but that of the composition as gradually as we please. Here, then, is the great importance of this composition as the principle of power for our use, because the whole product of it is available for impelling the piston uniformly at any velocity and pressure we please; and it is rendered still further valuable by the circumstance of its constituents being nearly all recoverable for recombining for future use.

The next principle demanding our attention is

WEIGHT.

This we must have—unalloyed by buoyancy—for without weight the air cannot be compressed, or the third principle—

ELASTICITY,

or resistance to compression—developed. But this weight must not be excessive, or the power will be wasted, or its use for transmitting valuable cargo greatly diminished. The weight will, of course, depend upon the size of structure, but for one of the following dimensions, viz., 14ft. long, 7ft. wide, and 6ft. high, fitted with generating cylinder 16ins. diameter and 40ins. long, and with all other necessary apparatus, need not exceed half a ton; to which we may add 5cwt. of composition for generating and maintaining its power. If to this we add an equal weight as useful cargo, we then have a total weight equal to 1½ tons. By employing 4 propellers, each 4½ft. wide by 9ft. long, we have a total surface equal to 162 sq. ft. to raise and support this weight in the air.

Having therefore (as in the case of the birds, or in comparison with the female bird, a body of 2000 times the weight and doubtless the power), the weight of this body and the surface of the propellers for raising and maintaining such weight in the air, we have first to find the true velocity required of such propellers. As before, we have $\frac{P\times S}{W}=c$, and $\frac{V}{c}=x$; then $\frac{x}{a}=y$ is the number of actions required.

The atmospheric pressure on one square foot is $14\cdot5\times144=2088$lbs., or say 1 ton. By raising and depressing the propellers through an angle equal to 90° on each side of the body, we have this surface propelled through 180° of a circle 9ft. in diameter; therefore through a space equal to 14·14 feet at each stroke. Consequently,

* I have had no means of ascertaining what quantity of water can be vaporised by the heat evolved from a given quantity of this composition, but I think it not unreasonable to estimate its heat-giving power at one-fifth that of coals; if so, we have (from 5 grains, $3\cdot2\times5+6\cdot5=22\cdot5$ or) 4·5 cubic inches of gas and steam generated per grain.

$\frac{1\times162}{1\cdot5}=108$, and $\frac{1200}{108}=11\cdot11$ft. per second, the velocity required. Then $\frac{11\cdot11}{14\cdot14}=\cdot79$ stroke per sec. or 47·5 revolutions per minute. This velocity of the above surface will develope a resisting force from the elasticity of the air equal to 1½ tons, and therefore the impelling force on the surface of the pistons must equal 1·5 tons + 10 per cent. for overcoming friction of machinery, or a total impelling force of 1·65 tons. By employing two cylinders of 4ins. diameter each, we have a piston surface equal to 25 sq. ins., which will require a steam pressure equal to 150lbs. per sq. in. through the length of the stroke to equal 1·67 tons impelling pressure. To obtain this pressure we must produce 9,500 cubic ins. of gas and steam per minute, of a density or pressure equal to 10 atmospheres. Then as 1gr. of composition produces 4·5 cubic ins. of gas and steam combined, of a density equal to one atmosphere, the product of 10grs. will be 4·5 cubic ins. of the density or pressure required; and $9{,}500\div4\cdot5=2{,}111\times10=21{,}110$grs., or about 3lbs. per minute, is the quantity of composition required to be converted into a propelling force for raising and maintaining in the air a body weighing 1½ tons.

To estimate the speed, we may take the surface opposing forward motion as equal to its greatest cross section, or 6ft. by 7ft., equal to 42 sq. ft. As the impelling effect obtained from the upward stroke of the propellers is equal to the power expended in that motion, we have a progressive force equal to 3,375lbs. to be neutralised by the resistance to forward motion. Consequently, $42\times190^2\times\cdot0023=3{,}400$lbs., or a speed of nearly 130 miles per hour can be attained before the resisting and the impelling forces will become equal.

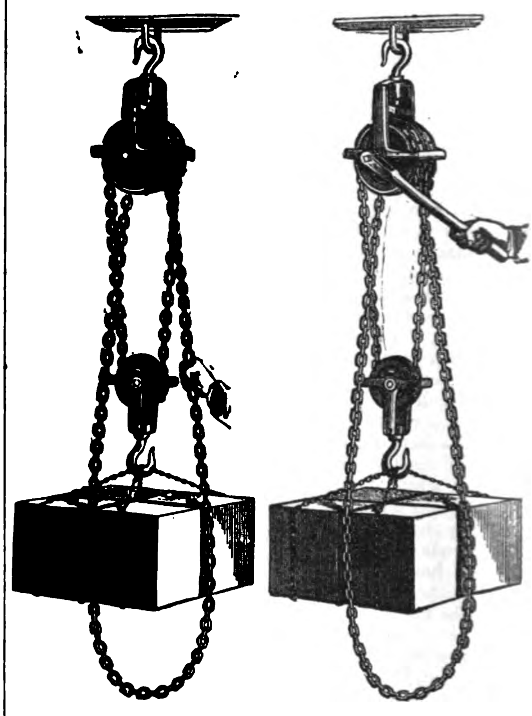
Birds, more conspicuously than any other animals, derive from the action of their propellers sufficient momentum for supporting and conveying them through a considerable distance after suspending all action of them; but we must guard against believing that during the time they are thus held suspended, the bird always descends by the force of gravity, for if they so willed they can and do ascend. This I have particularly noticed in order to decide this point. Continual action, therefore, is not required of them for their support, although they continue to rise and to proceed. This circumstance, as well as the rapid flights attained by various classes of birds, proves that their rate of progress does exceed the rate of motion imparted to their wings. It is evident that while the impelling effect obtained from the elasticity of the air by the upward stroke is equal to the bird's power expended in that motion, the resistance to its forward motion is the same as to that of a body projected longitudinally, and to which only the law of the square of the velocity is applicable.

Bishop Stanley states that "a pigeon flew 23 miles in 11 minutes, or at the rate of 125½ miles per hour." If we take the surface opposing forward motion (equal to the cross section of the bird's breast and anterior margin of the wings) at 7 sq. ins. or ·05 sq. ft., we have this extent of surface virtually resisting progression, and which at 125 miles per hour, or 183ft. per second, would meet a resistance $=183^2\times\cdot0023\times\cdot05=3\cdot8$lbs. We have seen that the elasticity of the air supplied a resisting, and, therefore, a progressive force equal to 1·3lbs. to the female bird's propellers. This bird was stronger on the wing than the male bird. If we suppose the bird that accomplished the above speed to have been stronger than this female bird, and that it could perform twice the number of strokes in the same time,—*i. e.* about eight strokes per second—and supposing their weights and the surfaces of their wings to be equal, then it would have developed twice the resistance to the surface of its propellers, or about 3lbs., and if the increasing momentum derived from its weight is taken at 25 per cent., which is not unreasonable in air, making the total $=3\cdot75$lbs., we have the resistance to forward motion, and, therefore, the speed satisfactorily accounted for; and that the bird would not (as according to the theory of some men) require to work its wings at the inconceivable velocity of 183 feet per second! (which is about three times the velocity of a locomotive engine) to obtain that rate of progress. Again, if we take the speed stated to be more generally attained by carrier pigeons, viz., 50, 60, or even 70 miles per hour, then the ordinary velocity of two or three actions per second would develope as much progressive force by the upward stroke as the resistance to forward motion at such speed would neutralise; 70 miles per hour, for instance, generating a resistance $=1\cdot2$lbs. only on an equal surface as the above.*

Yours, &c.,
W. Quartermain.

* A model, embodying the principles here advocated, can at any time be seen in the Polytechnic Institution, Regent Street, London.

WESTON'S DIFFERENTIAL PULLEY BLOCKS.



The peculiar merit attached to these pulleys is, that whilst they are more powerful than ordinary pulley blocks, they also possess the novel and invaluable quality of not "running down," under any circumstances, whilst the load is suspended to them.

The action of these pulleys may be thus explained:—The upper block has a double sheaf of two different diameters, with teeth gearing into the endless chain, which hangs from it in two loops, in either of which is placed the single block, having a hook for attaching the weight to be hoisted. If the toothed sheaves of the upper block were of equal diameters, the weight would remain stationary, whilst the endless chain was passing over them, owing to the same length of chain being drawn up on one side as was being pulled down on the other side; but as one sheaf is larger than the other, and as both sheaves being fastened together (or made in one piece) work together, the large sheaf takes up more chain than the small sheaf does, consequently the weight is raised proportionally. The purchase is about 22 to 1—that is to say, when 22 links of chain pass over the large sheaf, the weight is lifted the length of one link. This ratio is, however, varied in the different sizes and powers.

Each set has two speeds, a fast one—by pulling the chain—for light lifts and for running the tackle up or down to any desired point; and another—by using the lever and ratchet as represented, which gives a lifting power equal to an ordinary crab and blocks combined.

Lifting and lowering are effected by pulling opposite sides of the loops, either the slack one or that which bears the weight; or for the heavier weights, when using the lever, the motion is reversed by turning it over to work in an opposite direction.

A weight hung to the single block, in either loop, does not run back, even if the chain is suddenly let go, because the opposite sides of the loop pull against each other on opposite sides of the double sheaf.

These pulleys are exhibited at the International Exhibition (close to the Suez railway carriage), No. 2,020, Eastern Annexe, by Messrs. S. & E. Ransome & Co., Essex Street, Strand.

THE PARIS PERMANENT UNIVERSAL EXHIBITION.

WITHIN the precincts of New Paris, in the flourishing district of Auteuil, where Boileau gave poetic counsel to his gardener, where Molière composed his *chefs-d'œuvres* in the company of Racine, De la Fontaine, and De la Bruyère, Industry, the queen of our epoch, is raising, at this moment, a palace to modern genius. Its aim is to place upon a new footing exhibitions, the utility of which is incontestable. They began by being exclusively national and temporary. From being national they became universal. Henceforth the products of science, the arts, industry, agriculture, and commerce, will find a place in an universal and permanent exhibition. The splendid palace now building at Auteuil proves that the idea is leaving the realms of theory, and approaching realisation. Let us first examine the practical advantages of the scheme; we will then describe the building and its workmanship.

Persons are fond of repeating that distance is annihilated, that frontiers are disappearing, and that modes of international communication are being multiplied. It is true. They delight in exalting the marvels wrought by the union of science and labour, the grand modern discoveries, the admirable inventions of industry—and with good reason. But it is of the utmost importance to develope all the branches of human activity, and to expedite commercial transactions. The Universal and Permanent Exhibition offers these advantages, for its object is to bring together the producer and the consumer. It will save the one numberless researches—often unproductive. To the other it will offer a continual stimulus, and place at his disposal objects from all quarters of which he has need.

In periodical exhibitions one often sees exceptional works, true exponents of ability, but executed at great cost, and addressing themselves more to the curiosity of sightseers than the approval of practical men. These productions, which aim at effect, and are not meant for ordinary use, ought not to enter into competition with the samples of industrial labour. The Universal and Permanent Exhibition, on the contrary, will give satisfaction to industrial and commercial interests. It will tend to improve the welfare of the labouring classes, by leading the producer to unceasingly improve his work, until he at length attains a point combining excellence with economy. We are able to add that the scene of this specific tournament will be worthy of the city which Europe truly considers the capital, not only of France, but of the whole world.

The idea once conceived, its realisation was imperative. This is often the most difficult part. Happily for the project of universal and permanent exhibitions, it has found powerful support among large capitalists, who have undertaken to defray the cost of construction. When the building is finished, it will be placed at the disposal of exhibitors, a very long list of whom is already published. The programme is headed by those memorable words which were uttered by an august personage on a solemn occasion.—"Approach, all you who think that the progress of agriculture, the industry, and the commerce of a nation contributed to its general welfare, and that the more reciprocal intercourse is multiplied, the more national prejudices will be effaced." Also when this project was submitted to the Emperor, His Majesty was pleased to express to its authors his approbation of it, and the pleasure with which he should regard its realisation. Their Excellencies the Ministers of Finance, Agriculture, and Commerce, have accorded, by two official despatches, various permissions which show the sympathy of the Imperial Government with the idea of establishing in Paris an exhibition universal and permanent.

For a project of this nature the choice of site was of the greatest importance. Of course the founders would have greatly preferred to establish themselves in the centre of Paris. But they encountered insurmountable obstacles. How could they find in the heart of a great city an area sufficiently extensive (130,000 square mètres)? And even if they had overcome this first difficulty, the excessive value of the ground would have alarmed the greater number of exhibitors. At the same time, it was necessary that this site should not be too distant from business quarters, and that it should be united with the capital by rapid and economical means of communication. A large piece of land, situated on the verge of the Bois de Boulogne, between the gate of St. Cloud and the station at Auteuil, united all these advantages. It is now the property of a company, and the workmen are progressing with such rapidity, that already the plan of a monumental palace intended to receive the artistic and industrial products of the whole world is clearly defined.

When an edifice of this kind is required, its proportions must be colossal. The palace at Auteuil will present a *coup-d'œil* 500 mètres in length, that is to say, an elevation double that of the Palace of Industry in the Champs Elysées. The façade will extend along the new Boulevard granted by the city of Paris, commencing at the banks of the Seine, and terminating at the main street of Auteuil and the other ways of approach, which will complete the Parisian network. The effect will be magnificent.

Imagine one of these constructions invented by modern architecture, light, but solid, where iron and glass rest upon stone foundations. An entrance portal, in keeping with the grandiose character of the edifice, will give access to the centre of the building, which will be crowned by a dome more lofty than that of L'Hôtel des Invalides. At each end of the structure, elegant pavilions will complete the palatial effect, and will be accompanied on the right by a Machinery Annexe, on the left by a vast rotunda, intended for concerts and charitable fêtes. Such is the *tout-ensemble* of the building in course of construction by an army of workmen, under the direction of skilful engineers.

In the interior, the height of the building will be divided into two stories; but, by a happy arrangement, this division will not show externally, and one range of windows, extending the whole height, will give light to the treasures exposed in the galleries.

We hope (and the activity which presides over the work authorises us to entertain this hope) that the inauguration of the Universal and Permanent Exhibition will take place early in the ensuing year. Meanwhile, the enterprise is organised on a solid basis. The most influential representatives of universal industry have already sent in their adhesion, and head the list of exhibitors. This adhesion, however, does not at present imply any pecuniary contribution. The founders are liable for all expenses, up to the time when the exhibitors take possession. We may add, that during five days of the week, admission will be gratuitous, and that the detailed internal regulations will be settled by committees from the different nationalities.

Such has been the rapid advance of an idea, conceived in a liberal and straightforward manner. It deserved to be conceived and carried out in an epoch which has already accomplished such grand undertakings, and in a kingdom where industrial progress advances in concert with the national grandeur.—*Translated from "Le Constitutionnel," August* 28, 1862.

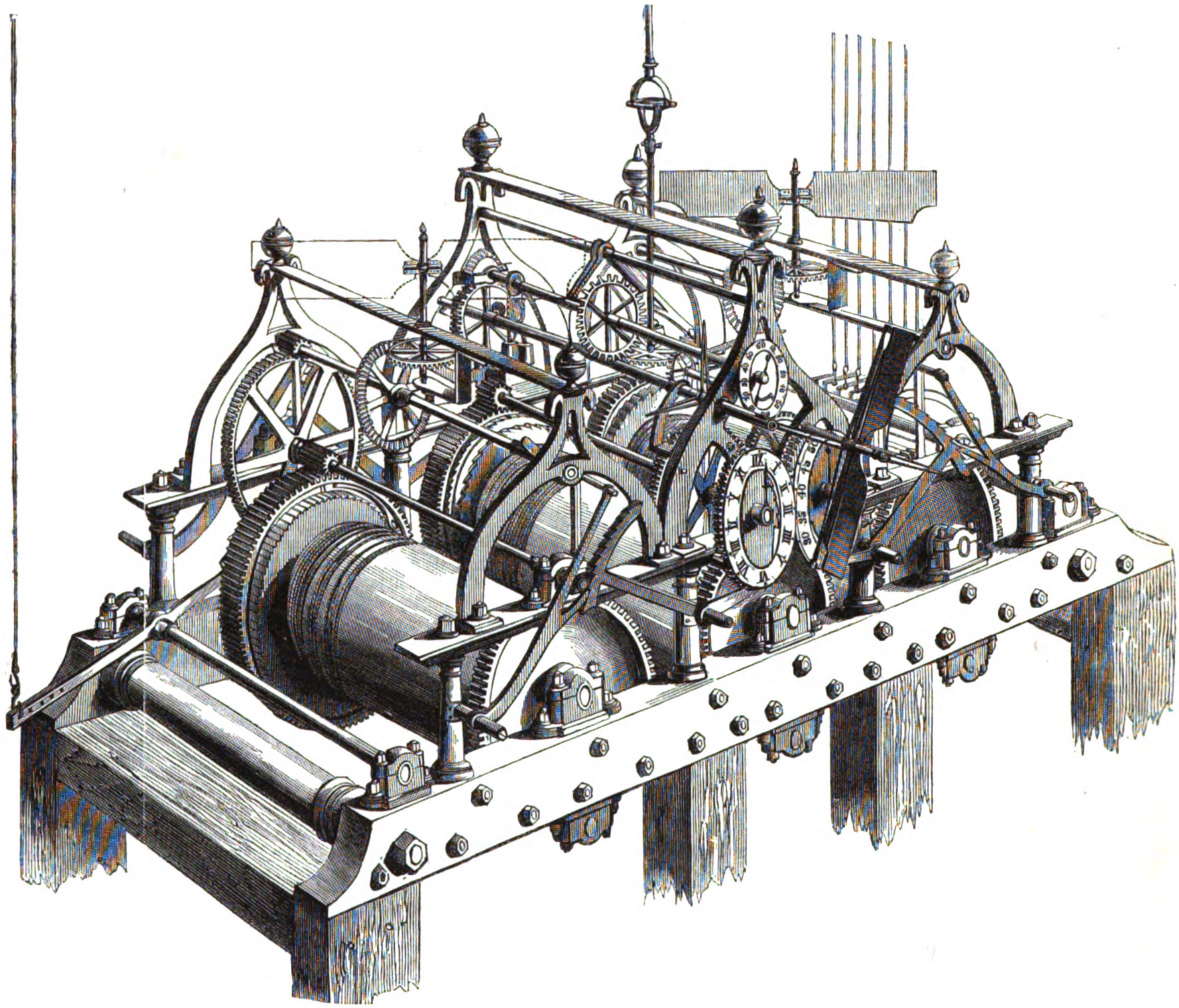
PHOTOGRAPHY ON MONT BLANC.

THE *Moniteur* contains an interesting description of an ascent of Mont Blanc, effected on the 11th ult. by M. Bisson, an eminent photographer, who had already performed the feat last year, but was desirous of completing his collection of views. His progress as far as the Grands-Mulets was not marked by any particular incident; he took various views from different points, and then proceeded to the Passage des Echelles, where he and his party crossed the ravines, some 300 feet deep, crawling on horizontal ladders one by one on their hands and feet. Their further progress to the Dôme de Goutté was, however, impeded by an unforeseen incident. A bridge of ice and snow, which had hitherto served as a passage to the Grand Plateau, had broken down, and they found a yawning abyss, from 45 to 155 feet in width, before them. No other passage seemed possible, and M. Bisson was on the point of giving up the adventure, when he was hailed by three of his men, who, unperceived, had sought a convenient place, and with their hatchets hewed out a path, by which they had succeeded in gaining the icy crest of the Mont Maudit. They soon descended the rocks on the other side, and threw ropes to their comrades, by which the luggage was hauled up. M. Bisson and the rest of the party followed the new but dangerous path, which brought them two hours sooner to the Grand Plateau. There new difficulties awaited them; they had to hew 800 steps, and ascend the side of the corridor, which in some places had an inclination of 50 degrees. On reaching the end of the corridor they were assailed by an icy cold wind. On arriving at the summit, after some further labour, M. Bisson found to his regret that the silver of his plates was crystallised, the temperature having suddenly fallen 10° Centigrade, although it was exactly noon. At 2 p.m. he descended from the summit, but visited it again on the 14th, and returned to Chamounix on the 15th without any further accident.

RAILWAY ACROSS THE PYRENEES.

ON August 21 the first railway train, drawn by locomotives, crossed the chain of the Cantabrian Pyrenees, over the northern division of the Tudela and Bilbao Railway, from the sea-port of Bilbao to the town of Miranda on the Ebro. The distance between these two towns is about sixty-six English miles, of which over forty are in ascending from the coast to the summit, 2,163ft. above the sea, being the lowest col or pass in the whole range of the Pyrenees. The average rate of ascent from the sea is 54ft. per mile; the maximum ascent is 76ft. The predominant curvature has a radius of only 300yds., and the curves are continually reversing. There are two points on the line at the entrance of the Basin of Ordima, distant only 600yds., measuring across the gorge or neck of the basin, which are fully 8¼ miles distant from each other in travelling along the line, and which differ 456ft. in level. The time taken in the transit is 2¾hrs.; and the scenery, as may be presumed from the locality and from the frequent change of direction on the line, is magnificent and varied. The last glimpse of the northern landscape the traveller has is over the Gujuli waterfall, and down to a depth of 400ft., to the bottom of the ravine into which it falls. The descent on the southern side is very gradual, the fall being on an average 24ft. per mile to the level of the Ebro. The total length of the railway is 155 miles—the length of the portion we have described being 66 miles, and the cost of these 66 miles more than 1,000,000*l.* sterling. The cost of the whole line, stations, rolling-stock, &c., was 2,500,000*l.*, all the capital being Spanish money, chiefly subscribed in Bilbao and its commercial connections. Not a share is held out of Spain or its colonies. A model of the passage of this railway across the Pyrenees is to be seen in the Engineering Court of the International Exhibition.

BENSON'S GREAT CLOCK IN THE EXHIBITION.



THE best time-keeper, when erected to its latitude with the necessary equation, is the sun-dial. But for obvious reasons we cannot have this time-keeper always at command, and men were driven to other shifts to measure day and night. The Romans had water-clocks for this purpose; the sand-glass was a time instrument, familiar to our own and other nations. But all such instruments were imperfect until the discovery of the pendulum, which, as everyone knows, depends for the regularity of its movements upon the law of gravity.

The discovery of the pendulum gave a certainty to the mechanical arrangements of time-measurers. It was now possible, after Galileo's discovery of the equal vibrations or pendulations of a body suspended by a string or otherwise from a fixed point, to measure time with greater accuracy than the best-constructed Clypsedron, hour-glass, or previous mechanical contrivance. But the best constructed clock gives only what is called *mean time*; that is, the clock exhibits 365 mean solar days, some odd hours and minutes, of 24 hours each, in equal parts. Consequently, the clock is sometimes in advance of true time, and sometimes is behind: hence the equation of time, and the directions given in almanacks to advance or retard the clock or watch in order to obtain true time.

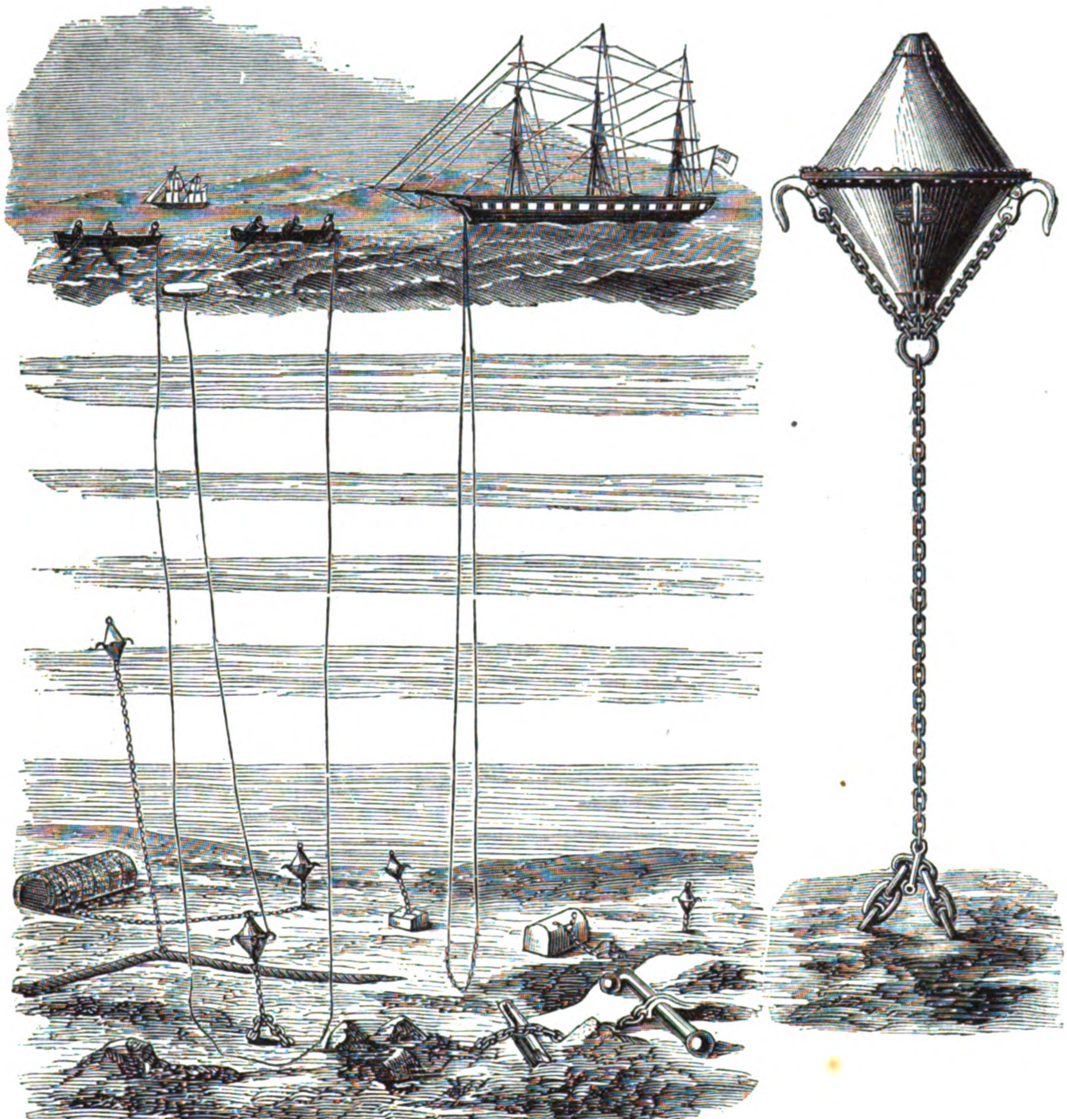
The pendulum clock is an advance upon the sun-dial, inasmuch as it does duty day and night, and, for ordinary purposes, does its duty well enough; but for the nice purposes of science, especially astronomical science, the pendulum cannot be entirely depended upon. The difference of a second may lead, in observing a heavenly body, to a mistake of tens of thousands of miles in distance. And so with the chronometer. This is not dependent on the pendulum, although the principle of the pendulum enters into it. Upon the accuracy of the chronometer depends the safety of the navigator and his crew. The variation of a few seconds might involve them in danger and shipwreck. We know to a mathematical nicety what ought to be the length of a pendulum vibrating seconds in any latitude. We can express in inches and decimals of an inch, extending to the moon and farther. The misfortune is that we cannot regulate the length of the pendulum without employing artifices: it has to be coaxed into doing duty, so to speak. The dull rod, like all of us, is affected by the heats of summer and the colds of winter. It is subject to temperature, and ever so nicely as we may measure its length in mean temperature, it is sometimes too long, at other times too short.

To keep the pendulum at a uniform length for a given latitude under every condition of temperature, has, therefore, been the grand attempt of mechanicians, and they have succeeded to such an extent that the year can now be measured out in equal portions so exactly, that there is scarcely the loss or gain of a few seconds at the close of it. The nearer we get mean time, the more valuable it is for all nautical and astronomical purposes. For example, a planet is due at a certain point in the heavens, according to true time; possibly, it has been retarded by the influence of other planets—disturbing forces have delayed it. As in the case of our own luminary, the moon, it keeps rather irregular hours It is by our knowledge of true time that we detect her shortcomings.

To describe the various artifices to keep the pendulum at its due length does not enter into our immediate purpose. The practical man has every detail at his finger's end; nor do we propose to ourselves the superfluous task of describing the machinery of a clock. There are, of course, different arrangements in the mechanism, but all depend on a common principle, and the end and object of every horological instrument is to tell mean time. Some of these instruments are better than others; some, too, are more ornamental and compact. The old-fashioned eight-day clock told the truth pretty well; his great-grandson tells the truth equally well, and is more of a dandy. Our fathers carried watches compared, for their bulk, to turnips. Watches are now made which a lady may carry on her finger-ring.

There are some most excellent specimens of horological contrivances in the International Exhibition. To name and describe them all would far exceed our limits. It is, perhaps, for the reason that large things attract rather than small, that so many people turn aside to view Benson's great piece of clockwork. It is certainly a marvellous achievement in clock making, both as regards the workmanship, and its capacity, under difficult circumstances, for time measuring. Its position in the Exhibition created a difficulty. We all know that the motive power of a clock is a weight, which ought to be near the machinery. In this case it is

TEMPLEMORE'S SUBMARINE RECOVERY BUOY.



200 feet from the machine, worked by pulleys under the floor. The frame of the clock is a wrought-iron bed of 9ft. 2in., with an upper bed of cast-iron 7ft. in length. The three principal driving-wheels are 2ft. in diameter, made of gun-metal 2 inches thick, and are a fine specimen of wheel cutting by machinery, the teeth of these as all the wheels being left untouched from the cutter. The liftings in the hour and quarter trains, are direct from the main power, thus securing accuracy and certainty of operation. One speciality in this large clock deserves notice. In case of wear, or derangement in any one of the large wheels, it may be removed without disturbing the others, as the gun-metal bosses are fitted in plummer blocks, being the first application of this convenience to clock-work. The length of the pendulum is 15 feet over all, and vibrates or sways once in two seconds. The weight of the oblong "bob" is 2 cwt., and the power of the clock nearly equal to that of Westminster. The efficacy of the machinery, and the time-keeping qualities of the clock, are due to the double lever *remontoir*, applied to Graham's dead-beat escapement, in which the mechanical arrangements are so disposed as to gain what is called "uniformity of pendulation." Hence, notwithstanding the difficulties under which the clock is placed, its error is within a second a day. The impulse of the motive-power does not swing the pendulum as women were wont to rock a cradle, but the motion is so uniform, that the arcs of pendulation are equal. The exactness and nicety of finish of the wheels would surprise anyone who learns that they are cut by machinery, without being in any way supplemented by hand-work. The ordinary observer notices the teeth of one wheel biting into those of another; he hears clickings, he sees parts disengage, revolve, and stand fast, and he is apt to look upon the clock as a complicated piece of machinery; but really the machinery or mechanism here is very simple, and, what is more to the purpose, it yields what we desire — a straightforward account. We ask "what's o'clock?" and the dial gives us the answer.

We say the dial; but in Benson's clock there are four dials, answering to the four sides of a church tower; and there is a fifth dial, which intimates the time of day to people in Cromwell Road. When we consider that this fifth dial is 70ft. above ground, and is worked by shafts distant from the machine some 300ft., we must admit the great achievement which has been here accomplished in clock-making.

We believe that Mr. Benson has a factory at Croydon, where all the heavier parts of his clock-work are cast and finished by machinery worked by steam power. The wheels are cast in gun-metal, the pinions are manufactured in steel. Here and at the workshops in the city, there are employed nearly 150 men. The number of watches produced at Ludgate Hill is something enormous, touching 15,000 yearly, manufactured on the most approved principle of division of labour, under the personal superintendence of the principal. The firm, as we understand, does not profess to make watches at the lowest price, but the best watches at the price; and from the magnitude of their business, and the necessity for more extensive premises, we may fairly judge that they have received the impress of public approval.

We would recommend the visitors to the Exhibition to do as we did — interrogate the attendant at this clock "trophy," whom they will find attentive and intelligent, and whose explanations will make an examination of this large clock both interesting and instructive.

TEMPLEMORE'S SUBMARINE RECOVERY BUOY.

Mr. Elton Templemore, connected with the Master Attendant's Office at Madras, has lately invented a Submarine Recovery Buoy, which has been patented in England, France, and other countries.

The patentee being engaged, during the year 1861, in recovering lost property, consisting principally of anchors and cables, in the Madras Roads, for the Madras Government, and being aware of the great expense which is necessarily incurred in all submarine operations, and the objections to diving on account of the danger to human life, and the limited

depth of water in which operations can be carried on, he has provided a plan by which for the future anchors and cables, and all submerged property, may be preserved from actual loss, and be recovered at any time without the aid of divers or any extraneous expense whatever.

The objections to the usual plan as applied to ships' moorings which the invention removes are these:—It is at times necessary, when a ship or other floating body is at anchor, to cut or slip the moorings, but before the moorings are let go, a rope and surface float is attached to the mooring chain near the hawser hole of the ship, or other floating body; the rope is of sufficient length to allow the buoy to float on the surface of the water. In this case, if the ship returns soon to her moorings, it is well and good, but if a longer time is allowed to elapse, she will find on her return that the buoy has disappeared, or what is invariably the case, the rope is in such a rotten state as to be completely useless for the purpose of raising the cable: the result of this is, the loss of the ship's moorings and the aid of the divers to seek it; but if it so happens that the anchorage ground is of soft yielding sand, the anchor and cable is irrecoverably lost, in consequence of its being buried out of sight under the surface of the ground; the same reasons hold good for jettisoned cargo.

In the case of lost property being submerged in a soft yielding sand, such as the Madras Roads, we have the subject in its most difficult bearing, the patentee assuming for granted that if successfully applied in this case it will overcome all difficulties eleswhere.

The practical experience of the patentee has shown him the insecurity of the present surface buoy, whether attached to a rope or chain. He therefore adopts a buoy to float under the surface of the water, which shall be free from all the objections with regard to the safety of the surface buoy. This buoy, which the patentee denominates a "submarine recovery buoy," is attached to a short piece of chain, by which it is shackled on to the ship's cable in the place of the ordinary buoy rope. The buoy has three hooks on its circumference, and, being of sufficient buoyancy to float itself, it will consequently remain floating near the surface of the anchorage ground, in a position suitable to be caught by the sweeping rope when required. For convenience and expedition in finding the exact spot, it may be attached to the ordinary rope and surface buoy; if this should disappear, the cable may still be recovered.

The patentee applies the buoy to all submerged property; if the articles are comparatively light, they may be recovered by the aid of the buoy fixed on the package itself; or, if heavy, a piece of chain of length sufficient to reach the surface of the water, and of sufficient strength to support the weight of the package, to the end of this chain the buoy is placed and let go, when it will remain in the position shown in the engraving.

Testimonials of its efficiency have been given by Sir William Denison, Governor of Madras, by the Master Attendant, and all the nautical authorities, as well as the journals of India, and by the undersigned:—

I can with pleasure endorse the opinions of the Superintendent of Marine on the general usefulness of Mr. Elton Templemore's submarine recovery buoy, and more especially for its invaluable use in saving anchors and cables slipped from in gales. It may also, while in soundings, be a certain means of saving treasure from the capture of an enemy.

H. D. E. Dalrymple,
Master Attendant and Conservator of the Port of Madras.

Having examined Mr. Elton Templemore's submarine recovery buoy, I have the pleasure to record my opinion of it as an invention likely to be useful in the recovery of articles from the bottom of harbours and roadsteads, but more particularly of anchors and cables, which may have parted or may have been slipped in soft mud or shifting sand.—(From J. J. Franklin, Esq., Superintendent of Marine, Madras, May 19, 1862.)

Mr. Lynall Thomas has induced the War Department to give him permission, at the cost of about 2,000*l.*, to manufacture a gun of 16 tons weight, on his principle, at the Royal Arsenal, Woolwich.

THEORETICAL FORMULÆ FOR THE MOVEMENT OF AIR IN CONDUIT-PIPES.

By Gen. A. Morin,

Academy of Sciences of Paris.*

(Concluded from p. 128.)

Introduction of the External Air by the Heating Apparatus.—By examining in a theoretical point of view the conditions of the introduction of air by hot-water apparatus, into the wards of the Hospital Lariboisière, and introducing the data from observation into the formulæ obtained, we obtain the following results:—

The temperature of the air furnished by the stoves being respectively

32°, 26°, 22°, 21° (Cent.);

the values of the velocity of inflow of the air into the wards were found

	mèt.	mèt.	mèt.	mèt.	
by the formulæ,	1·29,	1·21,	1·18,	1·17,	per second.
by experiment,	1·14,	1·04,	1·13,	1·15,	„

If we take into consideration the uncertainty which may exist as to the dimensions, and especially the obstacles sometimes inevitable, such as mere spider webs, which are too often found in the conduits and stove-pipes, it will be without doubt admitted that the accordance of the formula with experiment is at least sufficiently satisfactory to allow of its being taken, with some latitude, for an approximative rule for the arrangement and proportions to the apparatus in analogous cases.

The formula which is applicable to the cases just mentioned shows this remarkable circumstance, that the temperature of the air which traverses the stoves, which, it may be remarked, is very moderate, has much less influence over the velocity of that air during heating than the air of the ward at its normal temperature. This is the consequence of the slight height given to the stoves.

This result shows the necessity of giving to the stoves as great a height as possible.

As to the introduction of the air in summer, the same formula shows the insufficiency of the orifices offered by the stoves, and I recall in my memoir the easy means of remedying this, which I had already noted on other occasions.

Application to the Apparatus for Ventilation by Draught of the Hospital Lariboisière.—The work which I present to the Academy contains, moreover, a complete application of the principles exposed to the effects of ventilation which are produced in the wings of the Hospital Lariboisière, which are ventilated by draught. It is known that each one of these wings has three stories, each composed of a ward containing thirty-two beds, and a small chamber of two beds. The vitiated air is drawn off from the wards of each story by nineteen discharge-chimneys, which unite under the roof at the base of a general discharge-chimney, in which is the reservoir of hot water intended to stimulate and regulate the draught.

Taking into consideration all the circumstances of the movement of the air in these complex circulations, the mean velocity of discharge in the general chimney may be calculated, and we thus obtain a formula into which, introducing the data of observation of five experiments made, the first two in the winter season, when the temperatures of the external air were — 5° and 2° (Cent.), and the last three in summer, at an external temperature of 18·3° (Cent.), then, comparing the results of calculation with those of direct experiment, we reach the following results:—

	Temperatures of the air			Velocity in chimney	
	External	Wards	Chimney	Formula	Experiment
	Cent.	Cent.	Cent.	Mètres	Mètres
Jan. 11, 1861	−5°	15°	19°	1·465	1·39
„ 20, 1861	−2	15	18	1·334	1·24
Aug. 31, 1861	18·3	21·5	38·1	0·949	0·95
		22	41·2	1·051	0·94
		22	40·9	1·041	1·07

The examination of these results shows that, even for cases as complex as those here considered, the principle of living-forces or work, leads to formulæ which accord as well with practice as could be expected in such applications.

This comparison also shows the enormous influence exerted by the losses of force and resistance of the walls, upon the effects which the difference of temperatures would naturally produce. These two causes conjoined reduce the velocity of discharge in the chimneys to about 0·33 of what it would have been if they could have been avoided; which shows the importance of all the arrangements which diminish these effects, which, however, cannot be entirely got rid of.

Finally, the application of which we have discussed the results, shows that in the denominator of the fraction placed under the radical of the expression for the velocity, the term which depends on the loss of living-force enters for 0·864 of its value, and that arising from the resistance of the walls to 0·136 only; which shows the importance of avoiding complicated circulations.

Application of the Discussion of the Experiments made at the Conservatoire des Arts et Metiers.—Besides the application of the theoretic formulæ to the practical apparatus for the circulation of air, others were made for the discussion of the direct experiments which M. Tresca and myself had executed during an investigation into the chimneys of steam engines.

These experiments, which we propose to resume immediately, were tried under three different conditions:—

1st. Upon a zinc chimney of 0·24 m. diameter and 11 mètres high, entirely open at its two extremities, and under which were successively lighted one, two, three, and four gas-lights.

2d. Upon the same chimney surmounted by an elongated conical ajutage, of which the upper opening was made to vary by cutting it off, and giving to it successively the diameters 0·10 m.; 0·14; 0·18; 0·21.

3d. Upon a cylindrical chimney of 0·25m. diameter, surmounting a very conical base placed over a chandelier of 34 burners, and terminated by a conical ajutage, the edges of which were inclined 45° to the axis, and which had successively diameters of 0·210; 0·200; 0·180; 0·158; 0·182; 0·115; and 0·080 mètres.

In all these experiments were observed the external and internal temperature range and the velocity of the air in the pipe, or at its upper termination; the results of these observations were compared with the theoretical formula

$$V_1 = \sqrt{\frac{2\,g\,a\,H\,(t - T)}{1 + \left(\frac{1}{m} - 1\right)^2 + \left(\frac{m_1 A_1}{A}\right) + \frac{2 8\,L}{D}\beta}}$$

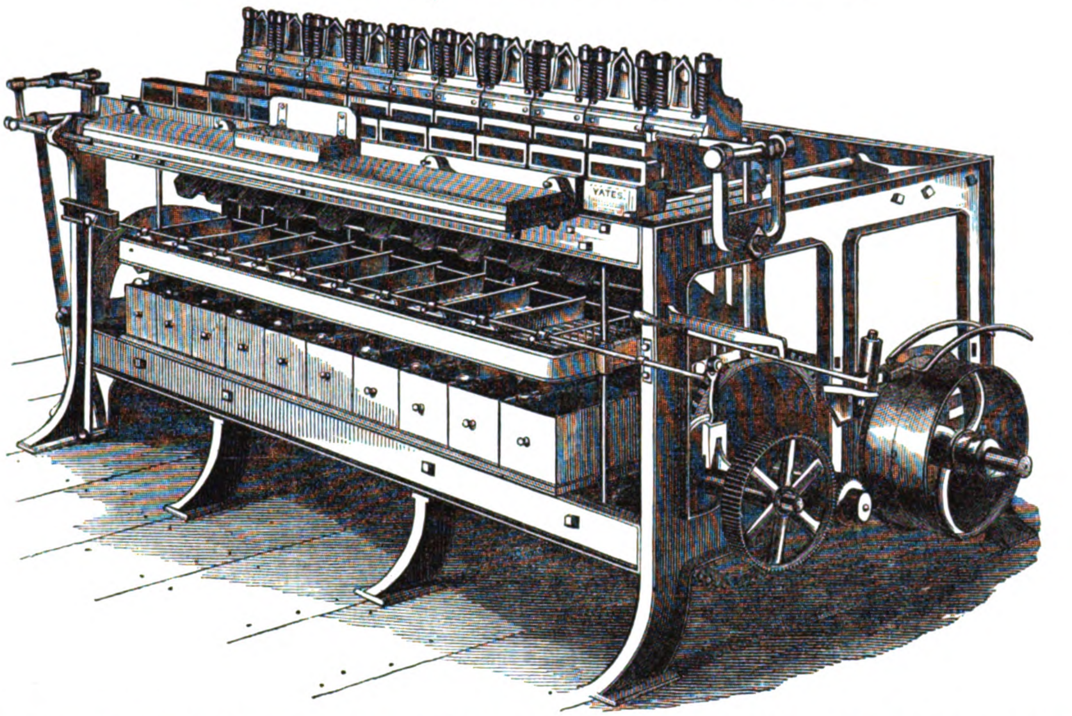
This comparison shows that, in these three series of experiments, the results of observation follow, as in the preceding cases, the law of the formula. But as this formula does not take into consideration the losses of heat produced by the thin metallic walls of these chimneys, it is necessary in every case to apply to it a coefficient of reduction, the mean value of which differs very little from 0·8; which shows within what limits the exactness of the theory explains the natural effects.

If the difficulties of the question and the uncertainties of the observations are taken into consideration, and if it be remembered that the greater part of the theories of applied mechanics, and especially that of water-wheels, often do not offer so regular an agreement with observation, it will be no doubt admitted that the formula which we have reached may be employed in the study of ventilation with as great a degree of exactness as the requirements of the art demand.

Graphic Representation of the Formulæ and of the Experiments.—When we remark, moreover, that for each peculiar arrangement in which the material data remain the same, and for a determinate mean external temperature, the preceding formula may be put under the form $V^2 = N\,(t - T)$; which is the equation of a parabola, or, more simply, that of a straight line passing through the origin of the coordinates, the abscissæ of which are the difference of temperatures $(t - T)$, and the ordinates, the squares of the velocities.

* Translated for the Journal of the Franklin Institute, U.S.

YATES'S BRISTLE-ASSORTING MACHINE.



It may be concluded that, as this straight line may be determined by means of a single well-made observation, we shall thus have, by graphic construction, all the velocities corresponding to the different temperatures, and reciprocally; which conclusion will permit us to solve, without calculation, several interesting questions of application.

Conclusion. — It is seen by this analysis of the researches which I have the honour to present to the Academy, that the application of the principle of living-forces, or of the transmission of work to the movement of the air in chimneys, or apparatus for ventilation by draught, leads to formulæ which, in very different cases, are found in accordance with experiment. These verifications are relative: —

1st. To the practical formula which observation had led M. Guerin to adopt for ordinary ventilation chimneys.

2nd. To the introduction of hot air by the stoves of the wings of the Hospital Lariboisière, heated by the circulation of water.

3rd. To the ventilation in general of these wings, both in winter and summer.

4th. To three sets of direct experiments made on metallic chimneys.

From this general accordance of the formulæ with the results of experiment, it appears, therefore, allowable to infer that we may, without fear of notable error, calculate beforehand the effect of different systems of ventilation by draught, and deduce laws which will be useful in building.—*Comptes-Rendus de l'Académie des Sciences*, February 24, 1862.

YATES'S BRISTLE-ASSORTING MACHINE.

One of the most interesting and ingenious pieces of mechanism in the Western Annexe of the International Exhibition is a machine invented by Mr. W. S. Yates for assorting bristles. It is generally at work, and invariably surrounded by an enquiring crowd of spectators. There is scarcely a machine in the Annexe which has secured more attention, or which deserves more. Having desired Mr. Yates to send us a description of the machine to accompany the illustration, he sent us the following:—

Sir, — In order that you may more perfectly understand the relation of the bristle-assorting machine to the brush trade, I may observe that bristles as imported are in a mixed state, and require to be separated into lengths or sizes, and sometimes into diameters with regard to the strongest bristles.

Before the introduction of this machine, it was done exclusively by hand, the workman holding the bristles in one hand, and with the finger and thumb of the other dividing them as required, requiring long practice to enable him to do this efficiently—a most tedious and unprofitable process, and exhibited the trade in a state far behind the mechanical requirements of the age.

A visit to the last Exhibition, 1851, caused me to ask what could be done for the brush trade (that being the business with which I was originally connected)? I saw that there was great need of better tools; that, as a trade, it presented some of the most difficult problems, in the solving of which, years of study and experiment would be required, but, when accomplished, would be to the advantage of the business, economising the cost of production, enlarging the market, and enabling the workman to obtain better and more constant employment. I determined to try what I could do, and began with the beginning—the dressing of bristles, and, like too many young mechanics, attempted too much. Experience soon made me wiser; and, after three years of close application, I succeeded in trying my first machine. I had the pleasure of seeing it separate the bristles into ¼in. lengths, and deposit them in appropriate receptacles. In order fully to test the machine, I began to dress bristles for the trade in my native town, and charging the men's price, but allowing a discount of 10 or 15 per cent., according to the amount of work required. By so doing, I was enabled to test the working capabilities of the machine in relation to almost all kinds of bristles, and, in 1856, obtained testimonials from the trade, in Leeds as well as other places.

I had great difficulty in carrying out my purpose, the men declining to work the machine, though I offered to guarantee that, individually, they should not earn less wages. I was compelled to teach strangers the entire process of bristle dressing, and also the use of the machine. As a body, the union men still refuse to work the machines.

About three years ago I exhibited a small machine in Whitechapel, and obtained the written approval of many manufacturers, but only one order. Since then I have had the satisfaction o sending out one of my largest machines to Russia, the first, I believe, ever sent there or elsewhere. It has been in operation rather more than two years, and has obtained entire approval.

The machine at the International Exhibition is the fourth, and embodies the experience of many years of study and experiment, and separates bristles into ten lengths, varying from each other ¼in. It can also be adapted, if required, to separate these lengths into their respective diameters.

To do this, a series of nippers, arranged side by side on a rocking frame, are made to open and close by the rotation of cams, suitably constructed for that purpose, operating through rods having at one end studs and bowls working in the grooves of the cams, and steadied by V slides, the other end being attached to the nippers; the frame to which the nippers are secured is then made to move backwards and forwards by crank arms.

In front of the nippers are situated two long V slides, containing a series of gill-combs secured to sliding carriages, which, when charged with bristles, are made to pass successively before the nippers, and each nipper, being a little in advance of the other, takes hold of the bristles within reach; the rocking frame, receding, draws out the lengths thus secured; the jaws of the nippers then open, and deliver the bristles on to a number of tin carriages, which, as the frame moves forward to its original position, gives a separate and distinct motion to these carriages, gently disposing the bristles thus separated upon a number of corrugated tables, which are afterwards raked off by the rakes attached to a long rod in front of the machine, a suitable motion being imparted by its connection with a slotted lever, and also a shorter one, with pin and bowl, working in a cam groove on a wheel attached to the main shaft of the machine.

The bristles thus find their way into the chambers connected with the before-mentioned corrugated tables, which, when full, are opened, and the bristles slide down in a body into the boxes below, and are ready to be removed.

An intermittent motion is communicated to the gill-combs and carriages by a twisted wheel attached to the preceding end of the main shaft of the machine; in this wheel a suitable cam-groove is made, imparting an oscillatory motion to a lever arm; to the upper end of this lever is connected a rod, which is carried through the end of the frame

underneath the slides containing the holders, and also through the frame at the opposite end; and at each end a paul is attached, which, acting against the ends of the carriages at proper times, causes them to move forward a stage; they are thus in succession made to pass before the nippers.

To prevent the need of an attendant at each end of the slides, one to insert the holders containing the bristles, and the other to receive the same when empty, another motion has been attached to the machine; two little carriages are made to wait upon each holder as they are in rotation pushed out of the long V slides before named, and are then conveyed to the opposite line of rails, and remain opposite to the openings of the same until the paul has had time to propel the holders out of this transfer carriage into the long slide or rails: in this way a constant change of position is secured, and the machine almost made entirely self-acting. With this addition, two boys would be able to dress as many bristles as would require at least eight men by the old process. The combs containing the bristles are caused to stand before the nippers sufficiently long to secure the whole of each length being properly drawn out; the number of draws to each length being governed by change wheels in communication with the main shaft of the machine. W. S. YATES.

PREVENTION OF COLLIERY ACCIDENTS.

AT the close of the late session of Parliament an Act was passed to amend the law relating to coal mines. This Act provides for every mine two shafts or outlets. It is now enacted that it shall not be lawful for the owner of a new mine, and after January 1, 1865, it shall not be lawful for the owner of an existing mine, to employ any person in working within such mine, or to permit any person to be in such mine for the purpose of working therein, unless there are in communication with every seam of the mine, for the time being, at least two shafts or outlets at work, separated by natural strata of not less than 10 feet in breadth, by which shafts or outlets distinct means of ingress and egress are available to the persons employed in the mine; but it shall not be necessary for the two shafts or outlets to belong to the same mine, if the persons therein employed have available means of ingress and egress by not less than two shafts or outlets, one or more of which may belong to another mine. The provision is not to apply to opening a new mine for the purpose of searching for or moving minerals, or to any working for the purpose of making a communication between two or more shafts, so long as not more than 20 persons are employed at any one time in the new mine or working. If the owner of an existing mine object to the Secretary of State that, by reason of the nature of the mine, or from other special circumstances, he cannot comply with the new law, a reference is to be made to arbitration, and an extension of time may be granted, or the owner required to make two outlets for the safety of the workpeople or otherwise. Further, the Act provides a summary proceeding, by way of injunction, to restrain the owner working a mine to which there are not two shafts or outlets. Any of the courts of equity or common law may, upon the application of the Attorney-General, acting on behalf of the Secretary of State, prohibit by injunction the working of any mine in which any person is employed in working or is permitted to be for the purpose of working in contravention of the provisions of the Act, and may award costs; but the section is to be without prejudice to any other remedy permitted by law for enforcing the Act. No person is to be precluded by any agreement made before the passing of the Act from doing anything that may be necessary for providing an additional shaft or outlet to a mine where the same is now required, nor be liable under any agreement to any penalty or forfeiture for doing what may be necessary to comply with the present Act. The powers now given are to be construed with the Principal Act; and it is fervently to be hoped that, by the exercise of the authority now vested in the Government, there will be no further sacrifice of human life by accidents in coal mines.

Correspondence.

[*We do not hold ourselves responsible for the statements of our Correspondents.*]

THE TRUE PRINCIPLES OF AIR NAVIGATION EXPLAINED.

TO THE EDITOR OF "THE MECHANICS' MAGAZINE."

SIR,—I regret to observe that Mr. Quartermain has resumed the discussion of this subject with views not very greatly improved, and upon one point precisely the same as they were on the former occasion, when I took the liberty of explaining to him that they involved the principle of perpetual motion. The point to which I allude does not end in that absurdity, but it is a serious error, and it lies at the very foundation of his project. In bringing forward the elasticity of air as affording the resistance to compression, on which propelling efforts in flying, or in balloon directing, are to act, and in ignoring the mobility of air which would be destructive of his hypothesis, he fundamentally errs in the physics of his subject. He is not singular in this sort of error. Even the most able of mathematicians, consummately skilful in handling the instruments for forming didactive trains of thought, do sometimes egregiously fail in reference to the practical character of their conclusions, because not apt at inductive investigation, and not disciplined to its peculiar order and habits of thinking, they forego correct physical conceptions of their subject in favour of imaginary modes of acting. The celebrated Euler, for instance, was as puerile and impotent in physics as he was powerful in mathematical analysis. He found it easier, and more manageable, too, for subsequent treatment, to feign things out of his own head, than to go to nature for instruction and ideas. Mr. Quartermain, therefore, finds himself in good company; but as similar errors require similar treatment, I propose to send him to experiment and observation for the correction of his opinions.

Let him take some light material in his hand, say a foot square of pasteboard, and force it against the air with the greatest velocity he can give to it, when he will convince himself, roughly yet quite sufficiently, by the very slight resistance he will perceive, that a wing surface of only 41¾in., with a velocity of only 3½ft. per second, will never raise a bird weighing rather more than 1¾lb.; and yet this is the conclusion, avowedly, to which his theoretical phantasy brings him. To be more precise, I refer him to Hutton's table of experiments, from which he may ascertain that the air will oppose to such a wing surface a resistance of about one-tenth of an ounce! Again, let him check suddenly the motion of his board of 144in. surface, and he will not perceive the slightest elastic rebound from the compression of air; but if he will take an air syringe, even of only one inch area, close the exit-valve and send down the piston with the same velocity, he will perceive that compression and elasticity are ready enough to give evidence of their reality, by producing a powerful resiliance when practically they do exist; and that restraint, or non-restraint, upon the mobility of the air in the two cases makes all the difference. Still, it is possible that compression and elasticity come into play with very low velocities of a moving body, but the fact is not sensible, and can have practical effect only in the very great velocities of military projectiles.

Mr. Quartermain's calculation of the resistance which air opposes to a wing surface of 41¾in., urged with a velocity of 45½ft. per second, though based on correct principles, and therefore oppugned by him as producing incredible results, is not accurate, because he takes for datum a plane surface of that dimension. The amount of resistance should be doubled, because of the concavity described by him of the under surface of the wing, and therefore the velocity which he assigns to it as necessary should be reduced in the ratio of 1·414 to 1. The calculation is faulty again, in taking the average velocity and resistance of the wing, instead of the mean of the resistances, due to the squares of the velocities of the respective portions of it. He also assumes that the upward and downward strokes of the wing are equally timed, which I believe is not the fact, at least in all cases, particularly in the slower motions. Thus the 50 strokes per second, which he thinks so incredible, could be reduced to 25, and yet be equally efficient if the velocity of the down strokes were increased in the ratio of 1 to 1·414. The time saved would be given to slight pauses between the strokes, and to a slower movement of the upward strokes. This number (25) being further reduced in the ratio of 1·414 to 1 on account of the concave surface of the wing, namely, to 17, and again reduced for the other reason mentioned, we should arrive at a number of strokes per second not at all extraordinary. At any rate, be what they will, and however we may stumble in calculation, a resistance of the air proportional to the square of the velocity, or a little beyond it, and a series of absolute resistances determined by experiments, and which, perhaps, for sundry reasons, are somewhat greater in fact than are given in Hutton's tables, especially for the higher velocities beyond their range, but deducible from them—are the only legitimate data on which projects can be founded.

Yours, &c.,
BENJ. CHEVERTON.

Sept. 1.

Gossip.

Dr. Robert Angus Smith, of Manchester, writes to us as follows:—"The experiments at Liverpool on petroleum, spoken of by you two weeks ago, are, no doubt, very valuable, as a portion of a number to be made, but if taken by themselves they seem to establish nothing. You did not inform us of the evaporating point of the oils, and we do not, therefore, know definitely on what substances the experiments were made. If the oil burnt on the cold ground, it must have been a very dangerous specimen. The absence of very violent explosion is not remarkable. Explosion takes place when the vapour is mixed with air, and this occurs chiefly when there is evaporation in an enclosed space. Experiments made in the open air do not necessarily cause explosions. The two great facts to be remembered respecting the volatile petroleum are: 1st. That the vapour rising at the ordinary temperatures ignites readily, and when mixed with air explodes. It mixes with air like gas, and in this lies its hidden danger. 2nd. When water is thrown on the oil, the oil floats on the water and still burns; whereas, spirits mix with water, become diluted, and cease to burn. Having made many trials of these oils, I thought it well to guard against some of the conclusions drawn from the experiments alluded."

The iron trade of South Staffordshire continues to show some degree of improvement. The demand for ship-building plates is good, and there is a fair supply of orders for sheets, which, however, it is feared, may prove only temporary. Common bars are being sold at a very low rate by the second-class makers; but even for this kind of iron there are decidedly more orders than there were. The fine weather has a beneficial effect; and if it continue, we may hope for a slight improvement in the trade, though not a great one, while the American war and the consequent depression of the cotton districts, continues. The works at Wednesbury, engaged in the manufacture of railway wheels and axles, are rather better supplied with orders than they were. The pig iron manufacturers are again seeking an advance of prices. As yet buyers set their faces against any such augmentation, although no doubt the prices of pigs are low; but this is equally true of finished iron.

On Wednesday week a granite column, 31ft. long, and weighing nearly 35 tons, was brought from one of the quarries of Messrs. W. & J. Freeman, to their polishing works, Penryn, Cornwall. It was drawn by a team of forty horses, assisted by two hundred workmen, and attracted a large number of spectators. This block will form the shaft of a memorial column to the late Duke of Wellington, to be erected at Strathfieldsaye, by his son, the present Duke, who has intrusted Messrs. Freeman with the execution of the work. The design is by Marochetti, and includes a granite pedestal weighing over 40 tons, supported on steps of large dimensions. There will also be elaborate mouldings in polished granite, the whole being surmounted by a bronze statue of the late duke, by Baron Marochetti.

In July 1860 we exported goods worth 12,522,698*l.*; in July last year these figures dropped to 10,094,260*l.* In July this year they rose to 12,131,801*l.*, thus showing that the American war does not materially affect our prosperity. We export more cotton goods than anything else, next come woollen goods, and then follow our iron and steel manufactures. We do a larger trade in pickles than in furniture, more in butter than in books. Our horses seemed to be prized abroad, but not so much as our hats. Our leather is more sought after than our rifles, our gunpowder, or our bayonets, even in these days of war. We export considerable quantities of fish, beer, and bacon. In productions of art and articles of taste we import rather more than we export.

The works at Lossiemouth, N.B., for effecting the drainage of the Loch of Spynie, are now being carried on with energy. A strong cofferdam has been constructed to keep out the flood tide, and a turning sluice made at the bottom of it. This will enable the excavations to be made deeper for the foundation of the stone bridge, that is to be built within the cofferdam across the canal, a little above the high water mark. The bridge is to be founded upon piles and concrete. A few yards above the bridge four large self-acting sluices are to be placed on a flooring of stone.

We are given to understand that there is a good deal of activity just now in the Dolgelly district of Merionethshire, and expectation is on tiptoe about this auriferous region. St. David, at Clogau, has inspired the people with the conviction that gold is to be found everywhere in the neighbourhood, and gold can be washed from the soil in very fine dust on the top of Berthwyllyd Mountain, Cae Mawr, and Cefn Coch. Gold is also found in quartz at Cwmheisian; in lead at Tydyndwadis; in the alluvial on the bank of the Mawddach river; at North Dolfrwynog and West Dolfrwynog; again, attached to the roots of moss on the Tyddyndwaddis side, not far from the beautiful waterfall of Pistil-y-cain. It was found very rich in quartz and galena, at the Old Dolfrwynog, and has been discovered in other localities. Fine specimens were also found in quartz at the Glasdir Mine. A quartz vein, with visible gold in it, has recently been discovered at Ganthllwyd, about seven miles on the Maentwrog road from Dolgelly. The Cambrian Mine, on the Barmouth road, is producing rich gold in blende; and the neighbouring mine of Garthgell expects it shortly on the same lode on the opposite side of the river. The Prince of Wales Mine last week produced nearly 2lb. of gold from 7cwt. of ore; and St. David gave its weekly contribution of 160oz., 140oz. of which was obtained from 7½cwts.

Messrs. Brocklebank, of Cumberland, have launched a splendid new ship, 803 tons new, and 900 tons old measurement. Her length between the perpendiculars is 192ft., breadth of beam 32ft., and depth of hold 21ft. 6in. She is flush built, is to be ship-rigged, and will have two of Cunningham's patent reefing topsails main and fore. She is sister ship to the Comorin and Arracan, the latter of which made the passage to Calcutta in 84 days. The same day the Messrs. Brocklebank had the keel and part of the frame of a 660 ton ship cut out, ready for laying on the Burdwan's blocks, and a fine first-class coaster, now approaching completion in their yard, is expected to be launched next month.

The *Cumberland Pacquet* says: "We are glad to find that Mr. John Kennedy, the author of the beautiful model that has been attracting so much public attention and interest for the last few weeks, has resolved upon testing the Nautilus war screw, which he proposes to introduce for the double purpose of propulsion and steerage. Machinery adapted for the testing of the screw has been completed, and we believe the experiments are intended to be made in the Harbour here on Thursday (yesterday), when there will doubtless be a large assemblage to witness the proceedings. We may add that since we last adverted to the subject, Mr. Kennedy has been closely engaged in overcoming some difficulties that presented themselves against the practicability of his newly-designed motive power, which he has now entirely overcome, and his invention promises to be attended with the most complete success."

The Calcutta and South-Eastern Railway was opened for passenger traffic in January last. Other works of importance are being executed in India. The Piallee bridge is rapidly approaching completion, although the execution of the work has been delayed in consequence of the scarcity of labour. The Eastern Bengal Railway, and the two great iron bridges across the rivers Gohamuttee and Coomar, are nearly finished.

The *Court Journal* announces that the Prince of Wales has given directions for re-embellishing and fitting-up the Adelaide frigate, on Virginia Water, in a style of elegance similar to the Victoria and Albert yacht. The Belvidere is also being fitted up as a residence for Commander Welch. This fort was originally built by the old Duke of Cumberland, brother to George III., but, after his death, was suffered to go into decay, till George IV. had it put into its present state of repair.

At a recent meeting of the Academy of Sciences, some observations were made on a specimen of clay, sent M. Marcel de Serres, on which there was produced, by artificial means, impressions of rain similar to those of the antediluvian world which are described by geologists.

The arrangements for the formation of the fleet of the future for China are being pushed forward as rapidly as possible by Mr. Lay, who represents the Chinese Government in this country, and Captain Sherard Osborn, C.B., who takes the command-in-chief. The Amoy screw gunboat, late the Jasper, and purchased from the Admiralty, is under orders to leave Portsmouth, under the command of Commander Salwell, for the Victoria docks, where the squadron will assemble and complete their outfit prior to sailing for China. Captains Sherard Osborn, Burgoyne, and Allen Young will proceed at once to Devonport to take possession of the Mohawk and Africa screw gunvessels, which have been placed at the disposal of the Chinese Government by the Admiralty. The Africa is a new vessel fitted to carry four guns, has a tonnage of 669 tons, and is fitted with screw engines of 150-horse power, nominal. The Mohawk has been in commission, but is a very fine vessel of her class. She is of 670 tons, fitted like the Africa to carry four guns, and has seven engines of 200-horse power. The purchase of the Nimrod screw vessel at Portsmouth has been declined by Mr. Lay and Captain Osborn, owing to her defects having been found to be far more extensive than had been anticipated. Mr. John White, of the Medina dock and building-yard at West Cowes, has been commissioned to build for Captain Osborn's fleet a paddle wheel steamer of the Psyche class, but of rather larger tonnage and horse power of engines. She is estimated to realise a speed of 18 knots per hour. Messrs. Laird, of Birkenhead, have also been commissioned to build two improved gunvessels, their sides to be covered with shell-proof armour plating.—*Times.*

A chambered tumulus, which was discovered a short time since in a partially-ploughed field at Nympsfield, Gloucestershire, was opened on Saturday, under the superintendence of some gentlemen connected with the Cotteswold Naturalists' Club. The longitudinal area of the sepulchre was defined by eight massive unwrought slabs of great oolite, laid in pairs, and varying from three to four feet in width. The entrance was at the east end. It became obvious, from the distvrbed state of the interior, that at some remote period the barrow had been broken into and plundered. A great number of bones of both sexes were strewn around, indicating that the tumulus was the burying vault of some family or tribe, and not, as was at first suspected, the sepulchre of heroes. Altogether thirty-four femora were discovered, together with a skull, 22in. in circumference, some jaw bones, several of which evidently belonged to children, a piece of half-burnt pottery, some flint flakes, a boar's tusk, some pigs' bones and incisor teeth. The whole of these objects were removed, and will be deposited, *pro tempore*, in the museum of the Agricultural College at Cirencester, where they will be open to inspection.

The special jury appointed to decide the dispute between the Government and Mr. Thistlethwayte, in relation to the land for the erection of Portsdown Forts, has awarded that 95,200*l*. be given to that gentleman. His claim was considerably in advance of the sum awarded. Mr. Montagu Smith, Q.C., presided as assessor.

The next meeting of the British Association for the Advancement of Science will be held at Cambridge, commencing on October 1. The Rev. R. Willis, M.A., F.R.S., will preside, and the reception room will be at the Town Hall.

The drift gallery of the Attock Tunnel, India, is 1,505·5ft. in length. It is said that this gallery is experimental, and that on its successful issue, which is now almost certain, the main gallery, 44ft. lower, will be commenced. The east shaft of this latter will be 200ft. from the surface, and the west shaft 129ft. The bed of the river will be 75ft. from the main shaft, at the nearest point, and 109ft. at the most distant.

A scientific balloon ascent is shortly to be made under the auspices of the Berlin Academy, after the plan of Mr. Glaisher's successful attempts, which have created considerable interest among scientific societies abroad.

A fine collection of objects, collected by M. E. Renard during his sojourn in Phœnicia, has recently been deposited in the Palais de l'Industrie, Paris. This comprises a large number of jewels, with gold and precious stones; works in glass, clay, bronze, and marble; no less than sixteen large sarcophagi of white marble, or alabaster; and a great mosaic, more than 30ft. long and 20ft. wide. This has the usual border of foliage, but of unusual width; it is divided into sections of oblong form, containing heads of men or divinities, and is supposed to be of the Roman period.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

STEAM ENGINES, &c., 438, 441.

BOILERS AND THEIR FURNACES, &c., 406, 423.

ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 411, 416, 433.

SHIPS AND BOATS, including their fittings, 400, 410.

CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 427, 434.

FOOD AND BEVERAGES, including apparatus for preparing food for men and animals, *None.*

FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 408, 414, 419, 420, 425, 437, 450.

BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c., 403.

LIGHTING, HEATING, AND VENTILATING, 439, 444.

FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 404, 415, 426, 446, 448.

METALS, including apparatus for their manufacture, *None.*

CHEMISTRY AND PHOTOGRAPHY, &c., 429, 443, 449.

ELECTRICAL APPARATUS, &c., 413.

WARFARE, &c., 409, 432.

LETTER-PRESS PRINTING, &c., *None.*

MISCELLANEOUS, 401, 402, 405, 407, 412, 417, 418, 421, 422, 424, 428, 430, 431, 435, 436, 440, 442, 445, 447.

400. J. H. JOHNSON. *Improvements in machinery or apparatus for propelling ships and boats.* (A communication.) Dated Feb. 14, 1862.

This consists in the use of two shafts or strong rods sliding longitudinally to and fro in suitable bearings, placed near the bottom of the ship or vessel, and inside the same, such shafts or rods being parallel with each other and with the kelson, one being placed on each side thereof, and the ends of the two passing out through stuffing boxes at the stern, situate respectively on each side of the dead wood. Near the outer extremities of each of these shafts or rods is fitted a pair of hinged blades or wings, carried on a block secured to the propeller shaft, and so arranged as to be capable of expanding when pushed forward by the resistance of the water, and of closing again by the same resistance when drawn back, both propellers being wholly or partially submerged. In combination with each propeller are two movable stops or cross arms, made capable of adjustment longitudinally upon the propeller shaft by suitable coupling rods passing into the interior of the ship, the object of such arms or stops being to form a support for the wings to bear against when opened or expanded. The object of having two of such stops or arms placed one in front and the other in the rear of each propeller is to enable the propellers to act in either direction, and so propel the ship either "ahead" or "astern," as required. For this purpose it is only necessary to bring one or the other of the arms close against the wings, and to move the opposite one away therefrom, so as to allow the wings to expand either at the forward stroke (when the stops or arms are in a position close up behind them) or to expand at the back stroke, when the opposite stops or arms are brought close up to the wings. The two propellers are moved to and fro alternately, so that a constant propelling action is maintained. *Patent completed.*

401. W. F. SMITH and A. COVENTRY. *Improvements in, and applicable to, lathes for turning and cutting screws.* Dated Feb. 14, 1862.

This consists in employing three or more dies or cutters, but the inventors prefer to use three arranged round the article to be cut at a distance of 120° apart; these dies are cut in a similar manner to those for ordinary screw cutting with stocks and dies, and are carried by a stand, which is fixed to the slide carriage of the ordinary screw-cutting lathe, arranged so that the slide carriage can be quickly detached from the screw giving motion to it, and traversed on the bed independently of the screw. *Patent abandoned.*

402. H. COLWELL. *An improved truss for hernia, prolapsus uteri, and prolapsus ani.* Dated Feb. 15, 1862.

Provisional protection has not been granted for this invention.

403. T. RENISON. *Improvements in water-closets.* Dated Feb. 15, 1862.

This invention is not described apart from the drawings. *Patent completed.*

404. J. H. JOHNSON. *Improvements in timekeepers.* (A communication.) Dated Feb. 15, 1862.

This relates to a peculiar construction of what the inventor terms a "galvanic chronometer with centrifugal regulator," and consists: 1, of a peculiar construction and arrangement of electro-magnetic machine for actuating the works of the chronometer, and of which it forms a part; 2, of a peculiar construction and arrangement of centrifugal regenerator for controlling the speed of the electro-magnetic machine, and so regulating the movements of the chronometer. *Patent abandoned.*

405. W. Avery. *Improvements in machinery for the manufacture of screws, a part or parts of which improvements may also be used in the manufacture of pins, rivets, and nails.* Dated Feb. 15, 1862.

This invention is not described apart from the drawings. *Patent completed.*

406. G. H. Law. *Improvements in the construction of steam and other boilers.* Dated Feb. 15, 1862.

This consists in constructing the bottoms and those portions of steam and other boilers which are the heating surface thereof, as far as practicable, in the form or manner of pyramids, or halves, quarters, thirds, or other definite portion of pyramids, or as triangular, or approximatively triangular, troughs, or as cones, conoids, or the approximation thereof, or in manner of the forms and figures the reverse of these, or in honeycomb form. *Patent abandoned.*

407. J. Wall and T. Dodd. *Improvements in the construction and arrangement of apparatus for regulating the flow or passage of fluids.* Dated Feb. 15, 1862.

This relates to an equilibrium three-way tap so planned that, by movement of the spindle, a supply of fluid is permitted to flow through in one direction, and on movement the contrary way, the supply is closed, and the same fluid returned through the same tap or apparatus, and finally passed off or discharged by a third way. This tap has a rigid spindle, on which is a button or other valve fitted to close against suitable seatings. *Patent abandoned.*

408. C. Turner and J. Shaw. *Improvements in felted fabrics.* Dated Feb. 15, 1862.

This consists in the introduction of threads or yarns of wool, or any suitable materials, betwixt the layers, sheets, or films, transversely or crosswise, of the fabric, the whole being felted or wrought together into a compact substance or body by the usual process of felting, whereby felted fabrics are very much strengthened, or rendered more adhesive in their texture. *Patent completed.*

409. T. Horsley. *Improvements in apparatus for turning and closing the cartridges of breech-loading fire-arms.* Dated Feb. 15, 1862.

The cases of these cartridges consist of cylinders of pasteboard closed at one end with a metal disc; the charges of powder and shot, separated by a wad, are introduced into this case, which is then closed at the end by means of another wad, which is held in its place by turning over it the edges of the pasteboard cylinder. The present invention consists in apparatus for pressing down the wads into their places, and for securing the upper one. *Patent abandoned.*

410. J. Cooke. *Improvements in marine propulsion.* Dated Feb. 15, 1862.

This consists in certain improved methods of arranging screw and other propellers, whereby a high rate of speed may be attained with a comparatively small expenditure of power, such results being effected by pressing or forcing the water to the sides of the ship or vessel to be propelled. For these purposes the patentee uses either screw propellers of any of the known kinds, or any other propellers which may be adapted for the purposes of the invention, which does not consist in the form, but in the arrangement and disposition of the propellers with regard to the hull of the vessel. In order that the water may be pressed or forced into the "rim" of the ship or vessel, meaning thereby all that part of the vessel which tapers towards the stern, he places the screws or other propellers at certain convenient distances from each other in the rear of the mid-ship section, the same being arranged at such angles as to effect the purpose before-named, and being supported, when necessary, by bearings on the exterior of the hull. The screws or propellers are thus placed on each side of the hull opposite or nearly opposite to each other, and are driven by a shaft extending along the ship or vessel in the ordinary way, and actuating the whole system of screws or propellers by means of suitable gearing. *Patent completed.*

411. D. D. Kyle. *An improved method of communicating or signalling in and with railway trains.* Dated Feb. 15, 1862.

This consists in the production and maintenance of a continuous sound or alarum in any part or parts of a railway train, and in effecting the communication or signal by the interruption or stoppage of this constant sound or alarum. This is effected by forcing air or steam through a tube or tubes, which acts upon whistles or other suitable apparatus. *Patent abandoned.*

412. R. Bunting. *Improvements in the manufacture of bolsters and scales, and in machinery employed therein.* Dated Feb. 15, 1862.

This consists in cutting ornamental bolsters and scales of various designs in horn, bone, ivory, wood, pearl, tortoise-shell, gutta percha, india rubber, and all other materials adapted to the making of hafts or handles for cutlery, and especially for spring cutlery, table knives, bowie knives, and lock knives. The machinery consists of a table or bed, upon which are fixed bearings for supporting a shaft carrying fast and loose pulleys; a circular saw is keyed on the shaft for the purpose of cutting up the material, also a wheel or roller having the pattern cut on the face thereof, which it is desired to produce on the bolster or scale. The pattern roller is made to revolve, and the bolster or scale being held on a rest against it, the pattern is cut thereon. *Patent completed.*

413. J. Chatterton and W. Smith. *Improvements in telegraph cables.* Dated Feb. 15, 1862.

The inventors claim: 1, coating or covering the wires or strands of wires which are to be used for the external protection of the insulated conductor or conductors in telegraph cables with lead or other soft metal or alloy, whether such wires be previously tinned or coated with an adhesive compound or not. 2, coating or covering strands of wires, each strand composed by preference of three wires, to be used for the external protection of the insulated conductor or conductors of telegraph cables with an adhesive compound and gutta percha. 3, coating or covering such strands of wires as aforesaid with a mixture of marine glue or other suitable adhesive compound and fibrous material. 4, coating or covering such strands of wires as aforesaid with marine glue or other suitable compound mixed with fibrous material or not, and with one or more coatings of tape or other like suitable fibrous material. *Patent completed.*

414. R. Bell. *Improvements in treating fabrics or articles composed of animal and vegetable substances for the purpose of separating one class from another.* Dated Feb. 15, 1862.

This consists in subjecting fabrics or articles composed of animal and vegetable substances to the action of muriate or hypochlorate of manganese, and afterwards to the action of urine or chloride of sodium, and to the process of washing in rain water, or in water containing an alkali, by which means the vegetable substances are dissolved or washed away, and the animal substances are separated and retained for use. *Patent abandoned.*

415. A. H. Harrison. *An improved under-garment for gentlemen and ladies' wear.* Dated Feb. 15, 1862.

This consists of an under-garment, in which are combined in one article the two garments known as the under-vest or "jersey" and the "drawers." The patentee makes the garment open down the front, and also behind upwards from the fork of the drawers as far as the waist, and he fastens the same by buttons or other fastenings. He makes the sleeves and legs (by preference) of half length, and the garment may be composed of cotton, linen, silk, woollen, or other material. *Patent completed.*

416. J. Green. *Improvements in the method of, and apparatus for, signalling, which improvements apply to signals used with steam ploughs or cultivators.* Dated Feb. 15, 1862.

This consists in the use of a cord or rope formed of wire or other material, through which signals from the ploughman or anchorman can be made to the engineer. In order to effect this the inventor attaches one extremity of the cord or wire to a pulley or drum, which is fixed on the framework of the engine or windlass in any suitable way. The other extremity of the wire is attached to the anchor and plough, and, consequently, will be extended from one side of the field to the other. By this means the ploughman and anchorman can signal to the man in charge of the engine or windlass. The wire or cord is kept at the required tension by two cog-wheels of suitable diameter, with corresponding pulleys or drums acted on by a weight. This last apparatus is fixed on the engine or windlass, and is connected with a whistle or bell for attracting the attention of the man at the engine or windlass. *Patent abandoned.*

417. J. Russell. *Improvements in the method of raising sunken, submerged, or stranded vessels.* Dated Feb. 15, 1862.

The patentee claims the introduction into the interior and between the beams of the vessel of floats, pontoons, caissons, air barrels, or such like apparatus, and also bags or floats of a flexible nature, as described, and the introduction of air into the inside of these floats, &c., thereby displacing the water out of the hold and between decks of the ships operated upon. *Patent completed.*

418. F. W. Gerish. *Improvements in pumps.* Dated Feb. 17, 1862.

Here, in order to obtain a reciprocating right-line motion to the pump rod, a fixed toothed wheel is employed, and the shaft which gives motion to the pump rod passes through and rotates within the centre of the fixed cog wheel. On this shaft is a crank, on the crank pin of which is mounted a pinion, the teeth of which gear into the teeth of the fixed cog wheel. To the pinion the end of the pump rod is attached at a distance from its centre, corresponding with the radius of the crank; hence, by the rotation of the shaft, the crank will carry the pinion round with it; and as the teeth of the pinion at all times gear with the teeth of the fixed wheel, the pinion is caused to rotate on the crank pin, so that, supposing the pump barrel to be vertical, the pump rod will at all times be vertical, and will, when at its highest point, cross the centre of the fixed wheel, which, by preference, is formed with internal teeth. The barrel of a pump may, when desired, be in a horizontal or other position. *Patent abandoned.*

419. H. J. and R. Crawford, with R. Templeton. *Improvements in looms for weaving.* Dated Feb. 17, 1862.

The patentees claim, 1, the arrangement, construction, and combination of parts forming the self-acting movement or mechanism for actuating the rotatory shuttle boxes of looms for weaving, so that, when the weft in the shuttle becomes expended or broken, the shuttle-box is shifted round, and a new shuttle is brought into operation, as described. 2, the arrangement and construction of shuttles with spring spindles and lateral springs; also the forming of pirns with end recesses to be used with such shuttles, so that, when the weft is exhausted, or nearly so, the lateral spring is liberated, which brings into action the movement by which the shuttle-box is shifted round a cell, as described. 3, the system or mode of causing the rotatory shuttle-boxes of looms to be moved round to the extent of one cell, upon the weft breaking or becoming exhausted, which is accomplished by mechanical movement or combination of parts connected with the weft-fork or protector, as described. 4, the system or mode of letting back the "take-up motion" one or more teeth of the ratchet wheel while the loom is weaving, which is done by the arrangement and combination of parts described. 5, the system or mode of weaving checked, striped, figured, and other similar fabrics, by the mechanical arrangement or combination of parts for bringing the cells of the shuttle-box round in the required succession, as described. *Patent completed.*

420. J. Hodgkinson and D. Greenhalgh. *Improvements in machinery or apparatus for preparing or combing cotton, wool, and other fibrous materials.* Dated Feb. 17, 1862.

This consists, 1, in the use of one or more stationary knives in conjunction with a brush for pressing the fibrous materials into the comb. 2, in the use of an endless travelling apron for the purpose of removing the waste from the comb. The apron is composed of wire or bristles, set in canvas or other suitable material, or upon metal lugs, hinged together and working over the ordinarily chain wheels, and is kept clean by a revolving or oscillating stripper. *Patent completed.*

421. J. Whitaker. *Improvements in machinery or apparatus for pulping roots.* Dated Feb. 17, 1862.

Here the inventor employs a number of shafts mounted with cutters in a spiral direction, and gives to each shaft and cutters a compound revolving motion. All the shafts are placed upon a revolving frame, and each shaft turns on its own axis in a similar way to the well-known "sun and planet" motion, by means of toothed pinions gearing into a stationary spur wheel. The roots are placed in a box or case, and are pulped by coming in contact with the aforesaid compound revolving action of the cutters. *Patent abandoned.*

422. J. J. Van den Berg. *An economical fire-kindler.* Dated Feb. 17, 1862.

This fire kindler is composed of chips of cork and resin. *Patent abandoned.*

423. E. T. Hughes. *An improved method of, and apparatus for, collecting the gases given off from furnaces.* (A communication.) Dated Feb. 17, 1862.

This invention is carried out in the following manner: At the top of the furnace, and surrounding its opening, there is a metal casing having apertures for allowing the furnace to be fed, and also formed at the top so as to support the gas pipe or chimney, the bottom of which is at such a distance from the top of the furnace as to offer no obstruction to the feeding of the material. At the edge of the opening of the furnace, and at the bottom of the chimney, there are conical rings which support a cap or cover when the space is required to be closed. The cap or cover has a balance-weight for raising or lowering it with facility. When raised, the furnace can be fed, but when lowered, the space is effectually closed by the cover which collects the gases, and allows them to escape only through the gas pipe or chimney. At the top of the gas pipe there is a safety-valve, which opens when there is excess of pressure, but which is much higher than when the operatives are engaged. *Patent completed.*

424. T. and J. Birdsall. *Improvements in preparing hides or skins for tanning.* Dated Feb. 17, 1862.

Here the patentees employ a solution of hydrochloric acid, diluted to about one thousand and ten specific gravity, in which the hides or skins are submerged, which, in a short time, kills the lime, and opens the pores of the hides or skins, the residuum being afterwards worked out or extracted by the usual means. *Patent completed.*

425. J. Combe. *Improvements in machinery for winding cops, and in the treatment of cops, for warps and other purposes.* Dated Feb. 17, 1862.

This invention is not described apart from the drawings. *Patent completed.*

426. H. E. Quant, G. H. Fisk, and W. Davies. *Improvements in securing the ends of steel or other materials used for crinolines.* Dated Feb. 18, 1862.

Here the inventors use a skeleton metal receiver into which the ends of the steel or other material are inserted, and they are held or retained in this receiver by being pressed against a chequered or roughened surface or surfaces formed in the receiver, similar to the surface of an ordinary culinary grater, the necessary pressure being obtained in some cases by a curved flat spring of a similar length and breadth to the inside of the receiver, and which is inserted (upon the steel) through or under collars or clips left or formed upon the ends of the receiver. *Patent abandoned.*

427. J. H. Hastings, J. Freezer, and J. Woods, Jun. *Improvements in ploughs.* Dated Feb. 18, 1862.

This relates to the double furrow plough to be worked by two or more horses, according to the depth of the work to be done, and so constructed as to be capable of being set to any width or depth of work desired, and also of being adapted as a subsoiler when required for that purpose. The handle of the plough is similar in form and construction to that ordinarily used, and the beam is carried by standards or loads similar to those now in use. The frame is made of wrought iron, the side pieces being connected together by screwed rods, so as to be capable of being set to the desired width. A complete plough is attached to each side of the frame, one being in advance of the other. For ploughing turnip grounds or other similar purposes two cast breasts or plats are used to turn the mould over, and for ploughing wheat stubblers, instead of the two cast breasts, two wooden boards are used to leave the mould open to the atmosphere as much as possible without turning it over. For subsoiling the ground, the foremost plough is removed from the frame, and a subsoil-head is fixed on in its stead, which subsoil-head, being provided with one or two points or cutting shares, enter the ground. *Patent abandoned.*

428. R. Watkins. *Improvements in producing light in oil and spirit lamps, parts of which improvements are applicable to lamps generally.* Dated Feb. 18, 1862.

This relates in part to lamps of all kinds, and in part, and more particularly, to that class of lamps in which the light is produced from the gas or vapour evolved, generated, or raised from and by the application of caloric or heat to volatile oils, spirits, compounds, or liquids, suitable for the purpose, and consists in improvements in the form and construction and mode of fitting the burners movable, and other parts of lamps, and in admixing and compounding in the various specific proportions the oils, spirits, or liquids to be used therein. *Patent completed.*

429. C. D. Segoffin. *An improved apparatus for looking at photographic cards—"microphore."* Dated Feb. 18, 1862.

This consists in the construction of an apparatus of a rectangular form, three sides of which are closed, the fourth being partly open for the admission of light on to the card placed at the back, the smaller side opposite having a magnifying glass which allows of a good view of all the details of the photographic card. For viewing proofs that are placed in albums the inventor makes the apparatus without a back, so that all that is required to be done is to place the apparatus over the proofs to see them distinctly. The sides of these instruments are formed with stiff or flexible materials, and of a bellows form, that is to say, with parts folding on themselves. To these small apparatus he has given the name of "microphore." *Patent abandoned.*

430. J. Lees. *An improved trap for catching rats, mice birds, and other animals alive.* Dated Feb 18, 1862.

This consists of a box or case formed with open ends and top, or, in other words, a box formed with a solid bottom and sides lined with sheet metal; the top (if the trap be for catching small animals such as rats, mice, birds, &c.) may be formed of wire, or wire and sheet glass; one end also may be of strong glass; at the other end is a door or flap hinged to the upper part of the trap, the said door or flap having a spring bolt affixed to the outside thereof, so as to project beyond the bottom edge of said door or flap, the point of the said bolt taking into a hole in the bottom of the box or case. Within the said box or case, and at a short distance from the glass end thereof, a wire frame covered or laced with twine is suspended from the top of the trap; the top of said wire frame has a hook affixed thereto, which projects above the top of the trap, the said hook being used to keep the door of the trap up, when set for use, by a spring rod fixed to the said door, the other end of the rod being lightly adjusted and held by the aforesaid hook. *Patent abandoned.*

431. W. Clark. *Improvements in gas apparatus used for lighting cigars and other tobacco.* (A communication.) Dated Feb. 18, 1862.

This consists of a hollow metal tube fixed to a handle by means of a socket. The lower end of the first tube carries a tube of smaller diameter, serving for the filtration, and for the burner of the gas. The upper end of the hollow metal tube has a screw thread for the purpose of fixing a metal stopper therein, which is slightly fitted so as to allow of a small jet of gas escaping between the tube and the stopper. This stopper has an opening at its centre carrying a rod, having a valve at its lower part, and a hook at the upper part. This valve is

formed of several round balls forming a weight, which opens and closes hermetically the opening in the stopper. The hook at the upper part of the rod is attached to a cord of less length than that of an india rubber tube, which encloses the whole, and serves to conduct the gas. *Patent abandoned.*

432. M. HENRY. *Improvements in cartridges.* (A communication.) Dated Feb. 18, 1862.

Here the inventor employs a tube or case of metal, or other impervious material or substance not porous to damp, wet, or air. He preferably forms this case tubular or cylindrical, or as a short tube, and closes one or both ends by a plug or stopper of cork, india rubber, or gutta percha, and to one or both of which he sometimes fixes a disc or plate of larger diameter. He prefers also placing a collar round the tube to prevent its slipping too far down the barrel of the arm. He manufactures an improved ball cartridge thus: he inserts the ball into such tube, pushes it part of the way down therein, introduces the powder, and closes the tube with the stopper. He packs the groove of grooved projectiles with hemp, or the like soaked in or covered with tallow, &c. *Patent abandoned.*

433. W. BUSH. *Improvements in omnibuses and other carriages.* Dated Feb. 18, 1862.

This invention consists in constructing omnibuses and other carriages with parts thereof double, so that the bottom sides and top may, when required, be drawn out and afford increased accommodation. An ordinary omnibus, for instance, is built to hold twelve persons inside; by this invention the inventor proposes, that when required it shall contain twenty persons inside. The fore part of the carriage is immovable, but all that part commencing just in front of the hind wheels, together with the hind wheels and axle, are capable of being drawn say six feet from the fixed part, the space being occupied by duplicate parts, over which the parts of the carriage drawn out have been made to slide. The invention applies also to vans and other long-bodied carriages. The invention also consists in constructing the frames for omnibuses, trucks, and other carriages of angle iron, and in screwing, bolting, or riveting to the angle iron, for forming parts of the framing, two other angle irons, with timber fixed between the two last-named angle irons, to which timber the panels and other required parts to complete the carriage are screwed or otherwise secured. Thus the whole of the framing and skeleton of the carriage are formed of angle iron and of two angle irons with timber between them. The invention further consists in constructing trucks and carriages in such manner that they may be used on rail or tramways and in common roads. For this purpose the inventor fits a plate or plates under the fore part of the truck or carriage, free to turn upon a pivot, and connects the front axle and wheels to this plate. If travelling upon a rail or tramway, he bolts the plate so as to prevent its moving, but when the carriage is to run upon ordinary roads, he releases the bolts, when the plate and "fore carriage" are free to move about the pivot, and thus allow of the carriage turning. The wheels are such as will travel upon rails or trams as well as upon common roads. *Patent abandoned.*

434. W. FIRTH. *Improvements in machinery for digging or turning up soil.* Dated Feb. 18, 1862.

This invention is not described apart from the drawings. *Patent completed.*

435. C. T. MARZETTI and J. WATSON. *Machinery or apparatus for raising, lowering, and otherwise moving or disposing casks and other heavy bodies.* Dated Feb. 19, 1862.

This consists in using a tangent wheel and screw, or worm and worm-wheel movement, in combination with a winding barrel or shaft, upon which is wound the chain or rope, to the one end of which the cask or other body, or the object to be raised, is attached by a sling and hook or other means, whereby a considerable economy both of labour and space is effected. *Patent completed.*

436. J. T. PENDLEBURY and G. PENDLEBURY. *Improvements in machinery for doubling, folding, or plaiting cloth.* Dated Feb. 19, 1862.

These improvements consist, under one modification, in placing on each end of a sliding table one or more pairs of jaws, each jaw being attached at one end to a lever having its fulcrum between the points of attachment, the said lever being movable about the said fulcrum; each pair of jaws is connected together by a cross bar hung upon studs or centres, the upper jaw being longer than the lower jaw. A tappet is fixed on the said lever, or on a shaft forming the said fulcrum, and is acted upon by another tappet actuated by a spring for the purpose of keeping the said jaw or jaws open or shut as required, another tappet being situate on the said shaft for the purpose of opening or closing the said jaws as needed. Above the sliding table is placed a shaft having a longitudinal aperture, the sides of the said aperture being for the purpose of holding the cloth in the right position for the jaws to take hold of it. At the ends of the said aperture a wheel is attached, the said wheel being moved by a rack actuated by some part of the machine. On the ordinary doubling table a lever carrying a roller or rollers is so placed that when the lever moves upon its fulcrum, the said roller or rollers are elevated or depressed. The last-named roller or rollers come in contact with another roller, whose circumference projects a little above the surface of the said doubling table. At the other end of the doubling table to that where the sliding table is situated, a fixed or revolving disc, or a projecting arm, acts upon the cloth in the middle of its width, and doubles the same, the said cloth being then passed through or between the before-named rollers, and through the before-named longitudinal aperture, and over the edge of one of the said sides forming the aperture, is secured by the jaws, and drawn along until the sliding table arrives near the end of its stroke, when the rack and wheel before-named being acted upon by a projecting stud or other part of the machine, cause the shaft containing the aperture to so move that the cloth which is doubled or folded over one of the sides before-named shall be so situate that the said jaw or jaws, which are now open, being acted upon by a catch, and one of the before-named tappets, shall shut or close and secure the cloth at or near the end of the stroke of the said sliding table; the said sliding table will now return and carry the cloth along with it, and another part of the said cloth being folded over the other side forming the aperture before-named, will, by a similar motion to that before-named, be brought in a position for the jaws at the other end of the sliding table to secure it, and when the jaws open the cloth is brought down on the table in any convenient way. The edges of the said sides are notched to enable the jaws to secure the cloth. *Patent completed.*

437. H. B. BARLOW. *Improvements in carding or otherwise preparing cotton and other fibrous materials and in machinery employed therein.* (A communication.) Dated Feb. 19, 1862.

The object of this invention is to dispense with the use of the carding engines now employed; and it is particularly suitable for preparing cotton or other fibrous materials for the combing machines. In performing this invention, a lap is prepared by a blower and lap machine of the usual construction, or in any convenient way, and the lap so formed is placed at the back of the machine, and the fleece of fibrous materials passes between fluted rollers to a roller covered with card teeth working in a trough. This roller delivers the fibres to a large drum, also covered with card teeth, the fibres are forced between the teeth of the large drum by a current of air passing under the trough above referred to; the card fillet of the large drum is put on in annular rings, or in spirals, with a space between them, and the fibres are collected by the teeth of the cards until a certain thickness has accumulated; the large drum is then turned round in the reverse direction and the narrow fleece or fleeces of fibres are drawn off by a pair of fluted rollers or otherwise; these fleeces are then passed through drawing rollers, and are then ready for the combing machine. *Patent abandoned.*

438. J. NASMYTH. *Improvements in the method of obtaining motive-power, and of applying it.* Dated Feb. 19, 1862.

This consists in placing in the centre of a stationary cylinder a socket, in which turns a rod or shaft, passing through the cover of the cylinder at a suitable distance from the centre of the cylinder. The patentee places in it a movable solid circular substance, or a movable tube with an arm or arms fixed in the shaft, which shaft passes through the cover of the cylinder. The movable solid circular substance, or the movable tube with its arm or arms, circulates steam-tight between the top and bottom of the cylinder and the said movable solid substance, or the said movable tube. He places a plate of any appropriate material, which plate he calls a piston, and fixes it to the said solid circular substance, or the said movable tube. He then introduces steam or any elastic or non-elastic substance on the surface of the plate or so-called piston, by which the movable solid circular substance, or a movable tube with its arm or arms, moves inside the cylinder through a door attached by hinges or other means to the cylinder, which door is opened by the piston as it passes and is shut and kept shut by a spring fixed in a recess of the cylinder, or by the pressure of steam. *Patent completed.*

439. F. BARNETT. *An improved lamp or lantern for street lighting and other purposes.* Dated Feb. 19, 1862.

This invention is not described apart from the drawings. *Patent abandoned.*

440. W. B. ADAMS. *Improvements in springs and their arrangement for moving and stationary purposes.* Dated Feb. 19, 1862.

This invention is not described apart from the drawings. *Patent completed.*

441. N. SYMONS. *Improving the power of steam-engines by a different form of piston, internal top and bottom of cylinders, also for increased strength and lightness for all kinds of wheels, framework girders, blades of blowing fans, and paddle wheels.* Dated Feb. 19, 1862.

This refers to a mode of increasing the surface and motive power of pistons, internal top and bottom of cylinders, by means of corrugations, indentations, or grooves, or in any other form or shape that will increase the superficial area without increasing the diameter of cylinders. *Patent completed.*

442. J. TURNER. *Improved machinery for mixing, mincing, and pounding.* Dated Feb. 19, 1862.

This consists in constructing machinery so that motion is imparted to a cross-head by side levers and two sets of cogged or toothed wheels. Two of these are keyed on to a horizontal shaft, supported by a frame, the other wheels being connected with the levers. A mixing receiver, surrounded by a toothed band, and supported by a frame capable of being tilted, is situated beneath the cross-head, and is made to revolve on a centre point by a screw in the shaft. The whole may be fixed to a bench or dresser by a clamp or other means. The utensils may be attached to the cross-head aforesaid, and be either fixed or free. *Patent abandoned.*

443. W. HINTON. *Improvements in barometers.* Dated Feb. 19, 1862.

Here the patentee makes the dials or indicators of any description of barometer, especially of wheel barometers, either of glass ground, or of glass having paper, linen, calico, silk, or other similar substance attached thereto, with the various indications marked, printed, or transferred thereon; thus the dials would have a semitransparent appearance, and when placed in suitably-constructed framings facing the sea, could be observed from a distance. At night a light or illumination is to be placed behind the said dials, which being semi-transparent, will allow of their being raised to higher situations than usual, and thus permit of the various indications being seen with facility and accuracy, even from a great distance. *Patent completed.*

444. W. DAVIS. *Improvements in increasing the illuminating effect of coal gas, and other gases.* Dated Feb. 19, 1862.

The patentee claims: 1, increasing the illuminating power of coal gas and other gases by hydro-carbons, or carburetting materials, or enriching, or auxiliary agents, conveyed continuously from their receiver or holder, while the combustion of the gas under treatment is going on, to a receiver, holder, or part in such proximity to the burner at which the gas is undergoing combustion, that the heat produced by such combustion shall evolve vapours from the hydro-carbon or carburetting material, or enriching or auxiliary agent, which vapours shall combine with the gas under treatment, and thereby increase its illuminating effect. 2, the mode of increasing the illuminating effect of gas by hydro carbons or carburetting materials, or enriching, or auxiliary agents, contained in a holder below the burner, from which holder they are gradually raised to the neighbourhood of the burner by capillary action or other means, so that the heat transmitted from the burning gas shall evolve vapours from them which combine with the gas and increase its illuminating effect. 3, the mode of applying threads of cotton or other fibrous material for re-using the hydro-carbon or carburetting material, or enriching, or auxiliary agent, according to which the threads carried from the holder of the said hydro-carbons or agents are coiled or wound in the neighbourhood of the burner for the purposes set forth. 4, the mode in which the hydro-carbon or carburetting material, or enriching agent, is raised to the centre of the burner below the part where combustion is going on, so that it may give off vapours which combine with the burning gas, substantially as described. *Patent completed.*

445. J. PATERSON. *Improvements in means or apparatus for reburning animal charcoals.* (A communication.) Dated Feb. 19, 1862.

For this purpose the retorts, which are of a cylindrical form, may either revolve continuously in one direction, or partly in one direction and then in the other, and instead of being placed with their axes in a horizontal direction, they are inclined, and they receive the charcoal to be reburned at their higher ends through suitable channels, and then by the revolution of such retorts the contained matter will progressively traverse to the lower ends thereof, where there are vanes or cups, or other suitable means adapted to take up such matter and discharge it into a receiver projecting inwards from such lower ends, and having a communication with the cooling apparatus. Series of such retorts are also arranged to work together, each being caused to revolve, and being inclined from the feeding to the delivery end, as stated, with the delivery end of the first discharging by a suitable way into the feeding end of the next, and so on with the succeeding retorts of the series. The feed and discharge pipes are connected to the respective ends of the retorts in manner to admit of the retorts revolving. The charcoal from each retort, or from the last of a series of them, is conducted into suitable coolers before exposure to the atmosphere, and a jet or jets of water are used to operate upon the external surfaces of the cooling chamber, or the passage or passages to them to facilitate the cooling process. The lifting means at the ends of the retorts may be separate and operated by mechanical means. The patentee arranges the retorts when in connected series, so that the last of the series is that to receive the most heat, and the next less, and so on to the first, which receives the last. The gas or vapour generated during the process is allowed to flow back and escape by the feed-pipe, so as to avoid remixture with the manufactured or reburned charcoal. *Patent completed.*

446. J. GREGORY. *Improvements in candlesticks.* Dated Feb. 19, 1862.

Here, in order to hold candles of different sizes at different times securely in the nozzle and socket of a candlestick, and yet not interfere with the candle being raised therein, a grip or holder is applied within a suitable chamber or recess in the nozzle or upper part of the candlestick. It is preferred that this grip should be formed in two parts or lever jaws, with a space between them suitable to receive the smallest size of candle when the lever jaws are closed. These lever jaws are capable of being separated more and more, according as it is required that a larger candle should be placed between them. The lever jaws are pressed towards each other by a spring or springs, so that a candle when held between is pressed on both sides by the two lever jaws. Each of the two jaws turns on its own centre or axis. One end of one of the jaws passes out to the exterior of the nozzle of the candlestick, so as to admit of its being moved a distance by the finger when the two jaws are to be separated to admit of a candle being introduced between them into the socket; and the lever jaws are so combined that, by pressing the part of the one which protrudes, the other is also moved away, so as to enlarge the space or opening between the two jaws. *Patent abandoned.*

447. G. T. BOUSFIELD. *Improved modes of protecting iron boilers, tanks, and vats from wear arising from galvanic action.* (A communication.) Dated Feb. 19, 1862.

This consists, 1, in interrupting the galvanic action which is produced in iron boilers, tanks, vats, &c., by their connection with pipes, pumps, condensers, faucets, or other fixtures of brass, copper, or other metals electro negative to iron, by the use of insulating joints, by which the two metals are separated by a packing of india rubber or other con-conducting substance. 2, in arresting and depositing from the water, before it is admitted to the boiler tank or vat, the copper or other metallic salts held in solution by it, which it has taken up in its contact with the copper or brass fixtures through which it has passed, by first passing the water through a vessel containing zinc in small pieces, or its equivalent in galvanic properties, on which the copper or other metal negative to iron will be deposited, and not be carried into the boiler or tank to produce there a galvanic action, so destructive to the iron vessel. *Patent completed.*

448. J. WILCOX. *Improvements in the manufacture of frills or ruffles, and in the machinery or apparatus employed therein.* (A communication.) Dated Feb. 19, 1862.

The essential peculiarity of these frills, ruffles, or trimmings, is that the folds or plaits are crimped in one direction, and transversely to the cloth in a perfectly even and regular manner, and secured by stitches, in lieu of the fabric being puckered or gathered in the ordinary way. Another peculiarity is, that the hem or hems, or selvages, on one or both edges of the fabric, are crimped simultaneously with the intermediate portion. *Patent completed.*

449. G. P. LEE. *An improvement in tourniquets.* (A communication.) Dated Feb. 20, 1862.

This consists in the use of an arterial or compression pad, connected by a non-elastic band with an adjustable counter-acting pad, so that the flow of blood in any particular artery may be stopped without interrupting the flow of blood in the veins. The required pressure is applied and regulated by an elastic band attached to the end of the former (non-elastic) one, wound round upon, and itself securely fastened. *Patent completed.*

450. J. FRIEDLAENDER. *Improvements in machinery for scutching, breaking, and preparing flax, hemp, jute, and other fibrous materials.* Dated Feb. 20, 1862.

In a suitable framing, the patentee mounts a revolving shaft, on which is fixed a series of sets of lifting arms, which operate on tappet pieces fixed one on each of a series of vertical rods, mounted and working in guides fixed to the framing of the machinery, there being as many separate sets of lifting arms aforesaid as there are separate rods and tappets; the lower end of each of the aforesaid rods has a piece of wood or beater affixed thereto, and another piece of wood of the entire length of the series of beaters is also fixed to the bottom of the machinery; the bottom edges of the aforesaid beaters are formed rounded, and there are corresponding grooves made in the aforesaid solid piece of wood. One portion of the operations of this machinery is as follows:— The beaters being raised, the flax or other fibrous material is placed upon the grooved piece of wood aforesaid; the machinery being then set in motion, the lifting arms, as they rotate, release the beaters, and allow them to fall on the flax or fibrous material beneath, thereby breaking the straw and softening the same in a speedy and efficient manner without breaking the fibre. *Patent completed.*

PROVISIONAL PROTECTIONS.

Dated April 17, 1862.

1132. S. Rideal, railway carriage builder and engineer, Manchester, and R. Shepherd, gentleman, Great Grimsby, Lincolnshire. Improvements in railway break apparatus.

Dated July 15, 1862.

2029. A. Couvreux, 333 Rue Saint Martin, Paris, contractor. An improved centrifugal apparatus for breaking stones.

2031. A. Couvreux, 333 Rue Saint Martin, Paris, contractor. An improved centrifugal apparatus for casting stones and other materials, and in forming embankments and other structures.

Dated July 21, 1862.

2069. J. W. Green, 2 St. Paul's Buildings, Little Carter Lane. An improved method of cutting sheet and plate glass to any given design, giving the finished form the brightest polish possible. (A communication.)

Dated July 24, 1862.

2109. M. Henry, 84 Fleet Street. Improvements in apparatus for retarding and stopping carriages, especially applicable to railway carriages, and in disconnecting apparatus for carriages. (A communication.)

Dated August 2, 1862.

2191. E. B. Wilson, Parliament Street, Westminster, engineer, and M. Picard, Lyons, engineer. Improvements in the manufacture of iron and steel.

Dated August 5, 1862.

2200. M. J. Roberts, Esq., Pendarren House, near Crickhowell, Brecon. Improvements in means or apparatus for spinning and preparing wool and other fibrous substances.

Dated August 7, 1862.

2209. M. A. F. Mennons, 24 Rue du Mont Thabor, Paris. An improved self-inking hand stamp. (A communication.)

2213. J. H. Johnson, 47 Lincoln's Inn Fields, gentleman. Improvements in blast furnaces. (A communication.)

2217. B. Coombe, 30 Mark Lane, manufacturer. Improvements in apparatus or machinery for cleaning and decorticating wheat and other grain.

Dated August 8, 1862.

2219. E. Hall, Butts Green, Luddenden Foot, near Halifax, corn miller. Improvements in means or apparatus for preparing foreign grain for grinding.

2221. F. M. Jennings, Cork, merchant. A composition for coating ships' bottoms to prevent fouling.

2223. N. J. Amies, Manchester, manufacturer. Certain improvements in the manufacture of bearings, "journals," and "steps," employed in machinery, and for carriage and other axles.

2227. J. Tatham, Rochdale, machine maker. Improvements in machinery or apparatus for preparing, spinning, and weaving cotton and other fibrous materials, parts of which improvements are also applicable to other mechanism, in which an uniform or variable rotatory motion is required.

Dated August 9, 1862.

2228. J. Mackintosh, North Bank, Regent's Park. Improvements in obtaining and applying motive power.

2229. R. Fowler, Glasgow, timber merchant. An improved manufacture of woven, plaited, knitted, and other fabrics.

2231. Sir J. S. Lillie, Knight and Companion of the Most Honourable Military Order of the Bath, 105 Pall Mall. Improvements in carriage ways and footways.

2233. A. J. Moreau, chymist, and A. E. Ragon, gentleman, Bernard Street, Russell Square. Improvements in the mode of and apparatus for treating bituminous and carbonaceous substances for the purpose of obtaining the various products, volatile, liquid, and solid, which they contain, and also in the treatment and application of such products.

2235. T. De la Rue, 84 Westbourne Terrace. Improvements in the manufacture of pigments and writing inks.

Dated August 11, 1862.

2237. H. B. Barlow, Manchester. Improvements in machines for weaving, warping, sizing, and dressing. (A communication.)

2239. W. E. Newton, 66 Chancery Lane, civil engineer. Improved machinery for compressing powder for cartridges. (A communication.)

2241. T. Holdsworth, Shaw Lodge Mills, Halifax, manufacturer, and J. Crossley, Bank Bottom Mills, Halifax, machine maker. Improvements in means, machinery, or apparatus for warping, scouring, sizing, stretching, measuring, cooling, drying, and beaming yarns for weaving.

2243. N. J. Amies, Manchester, manufacturer. Improvements in the manufacture of bearings or steps employed in machinery and railway and other carriages, and in a composition to be applied thereto.

2245. M. H. Champion, 15 Passage des Petites Ecuries, Paris. Self-closing buttons fastening without thread or needles.

2247. J. Combe, engineer, and J. H. Smalpage, woollen draper and tailor, Leeds. Improvements in the action and arrangement of machines for winding cops, and in apparatus for holding and receiving such cops when used for warps or sewing thread or other purposes.

2249. A. J. Martin, High Street, Bow, J. Goss, Prospect House, Bow Road, and J. Bush, Bow Common, Bromley. Improvements in apparatus for distillation.

Dated August 12, 1862.

2251. W. Macnab, Greenock, engineer. Improvements in steam boilers and in apparatus for feeding the same, and for effecting circulation therein.

2253. J. Dickson, 66 Tollington Road, Holloway, gentleman. Improvements in treating zinc ores and solutions of zinc to obtain zinc therefrom.

2255. L. Serbat, Valenciennes, France, gentleman. Certain improvements in lubricating machinery.

2256. C. A. Wheeler, Swindon, Wilts. Improvements in machinery for perforating paper.

2257. A. Delrue, Dunkirk. Improvements in compositions for preventing and removing incrustation in boilers.

2259. J. Langran, Kimbolton, Huntingdonshire, millwright. Improvements in apparatus for driving agricultural machinery.

2261. A. B. Childs, 481 Oxford Street, engineer. Improvements in machinery for cutting veneers. (A communication.)

2263. G. Sanders, Nelson Place, Old Kent Road, gentleman. Improvements in domestic fire-escapes.

Dated August 13, 1862.

2265. J. Dickson, 66 Tollington Road, Holloway, gentleman. Improvements in the manufacture of chlorine for commercial purposes.

2267. J. Cooper, Town Malling, plumber. Improvements in valves and buckets for pumps, and in valves or cocks for other uses.

2268. J. Smith, Regent Street, Mile End Road, engineer, and J. S. Rayment, Rayment Road, Grove Road, Mile End, builder. Improvements in apparatus for generating steam and for regulating its flow, part of which improvements are applicable also to other purposes.

2271. W. L. Boyle, California; Eastbourne Terrace, dentist. Improvements in the construction of chairs and foot stools for the use of dentists, and in chairs, couches, and beds for invalids.

2273. H. Twelvetrees, Bromley, manufacturer. Improvements in rat and mice traps.

2275. L. D. Verstraet, chemist, and E. M. Olivier, proprietor, 29 Boulevart Saint Martin, Paris. A new process of manufacturing carbonate of soda by the application of sulphuret of sodium, and in apparatus for the same.

2277. W. Schnell, 63 Charlotte Street, Fitzroy Square. Improvements in extracting the sulphur and sulphurous acid from the oxy-sulphuret of calcium, which is contained in the residues or waste material obtained in the manufacture of soda. (A communication.)

Dated August 14, 1862.

2279. E. J. Dagnall, Point Pleasant, Wandsworth. An improved tray or receptacle adapted for wash-hand stands for holding tooth-brushes, tooth-powder, and nail-brushes.

2281. J. Irvine, Patshill, Salop, musketry instructor, and J. W. Hand, Beckbury, Salop, builder. A new or improved rifle rest.

2283. G. Welch, Birmingham, manufacturer. Improvements in inkstands, metallic pens, and penholders, and other instruments and appliances used in writing and marking.

2285. W. Beatson, Rotherham, stove grate manufacturer. Improvements in the manufacture of stoves.

2287. D. P. Marques, Barcelona. Improvements in apparatus for cleaning the bottoms of ships and vessels. (A communication.)

2289. J. Petrie, Jun. Rochdale, ironmonger. Improvements in machinery or apparatus for blowing and exhausting air.

2291. J. Hopwood, Ashton-under-Lyne, mechanic. Improvements in machinery or apparatus used for collecting fibrous material and dirt from the carriage boards and roller beams of mules and other similar machines used in spinning.

2292. J. Hearn, Hatford, Berks, clerk. Improvements in apparatus or appliances for raising sick or bedridden persons in their beds, and for lifting their bed-clothes.

2293. W. Soutter, Birmingham, coppersmith. Certain apparatus for raising and planishing metals.

2295. J. S. Blockey, Hyde Park, Leeds. Improvements in the manufacture of colouring matters.

2297. C. E. Spagnoletti, Telegraph Department, Great Western Railway, Paddington. Improvements in apparatus for signalling trains on railways.

Dated August 15, 1862.

2301. T. Carvin, Landport. Improvements in screw propellers.

2303. J. Newman, Birmingham, jeweller. Improvements in machinery for the manufacture of metallic tubes.

2305. J. H. Johnson, 47 Lincoln's Inn Fields, gentleman. Improvements in electro-magnetic time-keepers. (A communication.)

Dated August 16, 1862.

2307. H. Garside, Coupland Street, Manchester, engineer and machinist. Improvements in machinery or apparatus for marking, etching, or engraving on cylindrical and other surfaces.

2309. T. Knowles and W. Robinson, Manchester, machinists. Improvements in racks for window blinds.

Dated August, 18, 1862.

2313. F. Barnett, 164 Rue de Rivoli, Paris. An improved lamp or lantern for street lighting and other purposes.

2315. J. T. Oakley, Grange Road, Bermondsey. Improvements in heating stoves employed for drying and other purposes.

2319. H. Melton, Regent Street, hatter. Improvements in the manufacture of hats and caps.

Dated August 19, 1862.

2321. V. F. Cleuet, 182 Rue d'Allemagne, Paris, engineer. An improved self-acting apparatus for supplying boilers with water, applicable also to the raising and to the measuring of liquids.

2323. S. Boucher, Warchin, near Tournai, Belgium, flax spinner. Improvements in flax spinning, which improvements are also applicable to spinning of tow and hemp.

2325. T. H. Falkiner, Dublin, engineer. Improvements in the permanent way of railways.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

2343. C. Monson, Connecticut, United States. A new and useful repeating rotary engine. *Dated August 22, 1862.*

2345. E. S. Ritchie, Massachusetts, United States. A new and useful improvement in the mariner's compass. *Dated August 22, 1862.*

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

1132. S. Rideal and R. Shepherd. Railway brake apparatus.

1151. A. P. Tronchon. Walls, palisades, and other similar constructions.

1153. E. H. C. Monckton. Preparation of metal to be used in the construction of cannon.

1163. A. Dixon. Knife and fork cleaning machines.

1165. C. C. Creeke. Drain and other pipes.

1166. T. Lea and J. Smith. Alarms or indicators.

1171. A. Warner. Construction of vessels of war, and in floating or other batteries.

1180. W. Carpenter. Printing in colours.

1183. W. Fear. Joining the saw plates of veneer and other saws constructed in segments.

1191. J. Endean. Cocks, taps, and valves.

1194. J. Bond. Projectiles attached to vessels for war purposes.

1197. G. Davies. Manufacture of matting.

1200. G. W. Belding. Harrows or cultivators. (A communication.)

1204. R. Zimara. Heating and ventilating.

1216. J. Aspinall. Apparatus for the safe conveyance from sea to land of ship's papers, documents, money, and other valuables.

1219. A. Applegath. Printing in colours.

1226. T. U. Brocklehurst. Reeling singles, trams, organzines, and sewing silks.

1228. J. G. N. Alleyne. Iron and steel.

1233. A. Boyle and T. Warwick. Manufacturing hair pins.

1252. W. Clark. Preserving animal and vegetable substances. (A communication.)

1268. G. Davies. Electric apparatus. (A communication.)

1269. G. Davies. Nails, screws, and other analogous articles in malleable cast iron. (A communication.)

1293. W. Bodden and W. Mercer. Machinery for slubbing and roving cotton and other fibrous substances.

1295. R. Walker. Malting.

1299. R. A. Brooman. Superheating steam. (A communication.)

1301. M. Paul. Windlasses and capstans.

1324. P. V. Lefebvre. Fountain pens.

1333. F. Marrel. Forming wrought-iron bars for the manufacture of armour plates.

1353. W. Clark. Buckle or fastening. (A communication.)

1368. J. Combe. Machine for spreading and drawing into slivers flax, hemp, jute, and other fibrous substances.

1528. W. Petrie. Vessels for boiling chemical products.

1883. C. Cochrane. Manufacture of aluminate of soda and potash.

2025. F. M. Parkes. Manufacture of gas.

2135. T. Cook. Manufacture of envelopes.

2230. G. Hazeltine. Carriage wheels. (A communication.)

2256. C. A. Wheeler. Machinery for perforating paper.

2343. C. Monson. Reaping rotary engine.

2345. E. S. Ritchie. Mariner's compass.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Dated August 29, 1862.

557. M. Dodds.
561. S. Hague.
562. A. E. Ragon.
563. A. Potts.
564. P. Robertson.
566. J. G. Jennings.
568. L. Martin and O. Penfold.
570. J. W. & F. Davis.
576. J. Schofield.
578. T. Tillam.
579. A. Bedborough.
582. W. Conisbee.
583. P. & F. Schäfer.
591. A. J. Sedley.
592. G. H. Cottam & H. R. Cottam.
594. G. F. Guy.
597. J. Somervell & R. M. Somervell.
600. T. Bostock.
614. R. Wright.
625. J. Platt & W. Richardson.
645. W. S. Nosworthy.
647. J. B. G. M. F. Piret.
664. A. Rene Le Mire de Normandy.
673. P. Gondolo.
691. M. Henry.
765. R. Wilson.
766. S. Moore.
886. J. Clinton.
1017. W. E. Newton.
1107. W. E. Newton.
1247. J. W. & F. G. Caley.
1379. J. Fowler and J. King.
1395. J. Oxley.
1402. J. F. Milward.
1491. N. Thompson.
1604. H. Saunders and J. H. Miles.
1879. J. H. Johnson.
1896. C. Beslay.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1959. J. Whitworth.
1960. T. Meriton.
1995. T. Aveling.
2001. W. Brown and S. Bathgate.
1974. J. Field.
2064. A. V. Newton.
2109. W. E. Newton.
1983. S. Middleton.
1993. J. A. Simpson.
2021. B. Lauth.
2098. A. Applegath.

PATENTS ON WHICH THE SEVENTH YEAR'S STAMP DUTY HAS BEEN PAID.

2002. W. De la Rue.
1941. W. Johnson.
1964. P. E. Charton.
1969. J. & T. Hope.
1995. C. & J. Clark.
2021. G. Lowry.

LIST OF SPECIFICATIONS PUBLISHED

During the Week ending August 30, 1862.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s. d.		s. d.		s. d.		s. d.		s. d		s. d.
161	0 4	170	0 4	179	0 4	188	0 4	197	0 10	206	0 6
162	0 10	171	0 4	180	0 4	189	0 4	198	2 6	207	0 10
163	0 6	172	0 8	181	0 4	190	0 4	199	0 10	208	0 10
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THE

MECHANICS' MAGAZINE.

LONDON, FRIDAY, SEPTEMBER 12, 1862.

ENGINEERING SUMMARY.

Our readers will remember that three or four months since we announced that the Lords of the Admiralty, at the instance of the Atlantic Telegraph Company, ordered the steam-surveying vessel, Porcupine, to be prepared for taking soundings of a portion of the bed of the Atlantic on which the Atlantic cable was laid. We also announced that experienced officers had been appointed to undertake the survey, and that no doubt some valuable information would be obtained. The Porcupine has returned, and a fragment of a side-wind report has appeared in the *Times*. This report, which will be found in another column, says: "It is believed that, with the present limited "extent of telegraphic science, there is no "means of transmitting a message rapidly "through a great length of wire. One word "is said to overtake another, and it is averred "that the force requisite to be exerted by the "batteries for sending the fluid so great a "distance, must involve injury to the wire "by the necessary intensity of the electric "spark."

This is an absurd statement, and rests, we believe, upon no better or more solid opinion than that of an officer who, notwithstanding that by lecturing and otherwise he had prejudged the case, and shown himself a partisan of the Arctic or North-Atlantic scheme, before the Admiralty had complied with the request of the original Atlantic Telegraph Company, was yet permitted to accompany the expedition. His views, however, will have little weight, as his objections have long since been contradicted by such men as Professor Wheatstone, Dr. Thomson, Mr. Varley, Mr. Fleming Jenkin, and Mr. Thomas Allan, all of whom state in the most positive terms that a line, efficiently laid between Newfoundland and Ireland, will work at a speed of from eight to sixteen words per minute. Moreover, Messrs. Glass, Elliot, & Co., the contractors, have offered to guarantee the efficient working of such a line, under heavy penalties. As to large battery power being required for long lengths of cable, this objection is equally unsupported by fact. We happen to know that the Toulon and Algiers cable, which is 600 miles in length, is most efficiently worked with a power not exceeding sixteen small cells of Daniell's battery.

We may soon expect to find the Atlantic Telegraph enterprise again the subject of enquiry and speculation. We have heard that Mr. Cyrus Field is once more on his way to this country, and that he brings with him an additional proposal from the United States Government for uniting the two continents by telegraph. We hope that so great and so necessary a project will meet with sufficient cooperation in England to soon render it an accomplished fact. Governments as well as peoples would gain by a successfully-laid cable; and, consequently, Governments as well as companies should encourage the work. We shall have more to say on this subject soon.

The question of the fouling of iron ships has not attracted the attention of the Admiralty and of scientific men as it deserves; and if some remedy be not found for the evil, it becomes questionable whether iron ships are improvements on wooden ones. We find that the bottom of the Resistance, when placed in the dock at Portsmouth, on Tuesday last, was in an extraordinary condition; in fact, it was as foul as if the vessel had gone on a long commission instead of being on the home station. The entire bottom was covered with weeds and grass, patches of mussels were on the port side, together with a good sprinkling of barnacles. On the starboard side the barnacles extended from stem to stern, with weeds and grass in some places three feet in length. The mussels extended fore and aft, with barnacles as large as a child's head. It is, in fact, surprising how such foulness could have accumulated in so short a space of time. It was not because precautionary measures had not been taken. The ship's bottom was originally coated on each side with different protective compositions. On one side the composition was entirely destroyed, and patches of rust, more particularly under the quarter, had eaten their way through. It may be well said, that if the waters of the Medway thus foul our iron ships, despite the protective coverings given them, it is no place for the construction of docks and basins for their special reception. A few thousand pounds expended on scientific experiments would certainly throw some useful light on this important question. Mr. Mallet has some valuable information to communicate on the subject, and our readers know that we have more than once urged the Lords of the Admiralty to experiment on Mr. Grantham's plan, which has been so strongly recommended, and which no doubt would assist in solving a most difficult problem.

From an announcement in a San Francisco paper, we learn that ten floating batteries on the plan of the Monitor, with turrets, are in process of construction, and that workmen are employed on them night and day. They are all to be larger than the Monitor, and with such improvements as experience has thus far suggested. A Californian correspondent says that these vessels are intended for operation on the Atlantic coast, and are but a tithe of the measures, offensive and defensive, in progress in the East. The boat for San Francisco is to be built there, and to cost 120,000*l.* The wooden portions are to be constructed of Californian timber—oak or laurel—probably of both. She is to be an improvement on her prototype—the Monitor of Ericsson. She is to have a turtle-back deck, and to have hot water arrangements for scalding boarders. The systematic misrepresentations of America and American institutions and habits by the press of this country, have already produced their natural fruits on the other side of the Atlantic. The hatred against England is as strong in California, according to the *Times* correspondent, as it is in New York. The Northerners *everywhere* appear to be animated by one passion—that of intense hatred towards England. We sincerely hope that this feeling will not last, and that when Americans reflect on the calm and dignified attitude of our Government they will meet with something like contempt the calumnies of many of our public men and the majority of our newspapers. The "leading journal," which has done the most to produce this bad blood, is pretty sure to suit its tactics by the general events of the war. When the Southerners were successful, about twelve months since, the Northerners were sneered at; when the tide of fortune turned in favour of the North, the North was respected, and even complimented, for their "extraordinary vigour" and "multitudinous "efforts on land and water." Immediately M'Clellan was repulsed, the old spite against the North and everything northern manifested itself in malignant intensity. Should the Southern forces be again beaten, a different standard of criticism will be adopted. Success, as usual, will be worshipped. Our only hope is that the fratricidal war will soon be terminated; and, when terminated, we should like that both North and South, whether divided or united, may say that, during the mighty strife, both the English Government and the English people remained neutral in their conduct, and impartial in their criticism.

The accounts of the Metropolitan Gas Companies for the year 1861 have just been issued, pursuant to the 41st section of the Metropolis Gas Act. They show that the total paid-up capital of the thirteen companies amounts to 5,647,900*l.* The total income derived from the sale of gas was 1,385,592*l.*, being a considerable advance upon that of the previous year; and it is believed that the present year will exhibit a still further increase of revenue. The principal item of expenditure, that of coals, was 728,552*l.*; but this sum was reduced by 335,302*l.*, or 46 per cent., by the sale of coke, tar, and ammoniacal liquor. Several of the companies return their bad debts and allowances at 5,108*l.* on a rental of 574,901*l.*, being less than 1 per cent. The dividends which the companies have been enabled to pay have ranged from 6 per cent. the lowest to 10 per cent. the highest. It should seem that the companies are all in a highly prosperous condition; and the only one of them that appears in the creditable position of having given the consumer the benefit of its prosperity is the South Metropolitan, which is supplying its customers at 4s. per 1,000 cubic feet. It is evident that gas of great purity and of a high illuminating power ought to be supplied at a cheaper rate; and it is hopeful to find that several of the companies are approaching that point in the accumulation of reserve funds, which will bring them within the operation of the limitation clause of the Act, when gas consumers will be enabled to share in their prosperity.

The attention of the scientific world has lately been called to the balloon ascents of M. Glaisher, and several interesting facts have been brought to light which deserve to be recorded. It appears that when the voyagers reached the clouds, they found themselves surrounded with a dense mass of moisture, about two thousand feet in thickness, which, being passed through, a beautiful clear blue sky presented itself, with the mass of clouds floating below. After this, being above a mile and three-quarters from land, they could not perceive any clouds, but the air seemed to possess such expansive power that the balloon shot up very rapidly, so that M. Glaisher failed to obtain a photograph of the scene below. Several pigeons were thrown out, but dropped as heavily as a stone. Blindness began to be felt at five miles' altitude, and M. Glaisher's last entry of the thermometer was *minus* five, or thirty-seven below the freezing point. Subsequently he saw, but was unable to register, the barometer at 10°, after which he became almost unconscious; and when they had attained an altitude of six miles Mr. Coxwell's hands turned black and he began to faint. M. Glaisher then recovered sufficiently to hear his companion say, "I have lost the use of my "hands: give me some brandy to bathe them." The temperature was then below zero; and the water in the vessel supplying the wet-bulb thermometer was one solid mass of ice. At this point, the aeronauts seemed to incur great risk; for while M. Glaisher could not move,

Mr. Coxwell was seized with intense cold, and everything seemed now to depend upon the latter gentleman, whose self-possession and ease seemed wonderful. M. Glaisher says, "it "was quite characteristic of Mr. Coxwell," for he had never seen him without a ready means of meeting every difficulty when it has arisen; and so it proved, for just at this juncture, as the hoar frost surrounded his neck, and his hands were helpless, he seized the line between his teeth and pulled the valve open until the balloon took a turn downwards.

The height attained was certainly unprecedented, and from the description which has appeared in the daily papers, written by M. Glaisher himself, it seems to have been attended with no ordinary danger. M. Glaisher wisely concludes his interesting scientific notations by observing, that "it would seem from "this ascent that five miles from the earth is "very nearly the limit of human existence. "It is possible, as the effect of each high "ascent upon myself has been different, that "on another occasion I might be able to go "higher, and it is possible that some persons "may be able to exist with less air and bear a "greater degree of cold; but still I think that "prudence would say to all, whenever the "barometer-reading falls as low as 11 inches, "open the valve at once; the increased in-"formation to be obtained is not commensurate "with the increased risk."

MILITARY TRAINING IN FRANCE.

France is unquestionably the greatest military power in the world, whether judged by the number or the efficiency of the men she is able to bring into the field. Every man is more or less a soldier, and every soldier undergoes a system of training calculated to develope the highest physical and mental qualities of which he is capable. In her nine establishments for military education, she has constantly a large staff of officers and men undergoing a system of education of the highest order in every department of military study, and from these institutions she is continually sending forth to the various stations in which her immense army is located bands of well-trained men and officers, whose duty it is to impart the benefits of their special education to every officer and private of which this vast army consists. There is one branch of military knowledge in which every French soldier excels; and whether we look upon it in a sanitary point of view, or as rendering the soldier in the highest state efficient when called into active service, or as exhibiting the high developement of which the grand human machine is susceptible, its study is equally interesting and important: we allude to the gymnastic exercises of which the French soldier is capable, as the result of well-regulated systematic training. The attention of our high military authorities has been called to this subject, but, so far as our knowledge goes, there is little or no improvement upon our old drill routine. The mortality in the English army is said to be greater than that of any in Europe. Why should this be so? True it is the climate of some of our colonies is unfavourable to the health of the European, but the increased mortality is not confined to those regiments which are sent on foreign service. We have certainly the best fed, the best clothed, the best housed, and the best paid army in Europe; and if regular diet, regular discipline, and regular hours do not produce a lower rate of mortality in military than is found in civil life, we should seek out the cause and provide, if possible, the remedy; and we are decidedly of opinion that the adoption of some such system of gymnastics as that practised in France would not only tend to make our soldiers much more active and self-reliant in a campaign, but greatly to diminish the present rate of mortality. We will, therefore, furnish an outline of the system pursued at the Ecole Normale de Gymnastique, at the Redoute de la Faisanderie, near Vincennes, where three professors of the science and art of gymnastics, under a commandant, regularly train about 300 men and officers, the course extending through a period of six months, these men and officers acting afterwards as "monitors" or instructors in their respective regiments and battalions.

The gymnastic exercises are divided into five lessons, of which the first and second are elementary, and the last three, gymnastics applied to special purposes. The men are divided into three classes, the third consisting of recruits, the second of men who have passed the elementary course of a fortnight, which every recruit undergoes, but are not sufficiently proficient to commence the extended course of the first class. The following is a standing regulation:—"None but the "prescribed exercises are permitted by the "instructor; he must never allow the men to "attempt any extraordinary or exaggerated "feats of strength or dexterity that might "cause accidents or injure the soldier. His "aim must be to develope the strength, agility, "and dexterity of the soldier by a wisely re-"gulated exertion, and inspire him with that "self-confidence and energy which the various "occasions of his military life may demand. "He must strive to rouse the pluck and emu-"lation of the men by rendering the exercises "as agreeable and as easy as possible, taking "all necessary precautions to prevent them "from injuring themselves or becoming dis-"couraged. He must never forget that the "perfect safety of the soldier under training, "the pleasure of the various exercises, and, "above all, the soldier's own desire to excel, "are the first and secret elements of suc-"cess in gymnastics. Harsh treatment must "be carefully avoided, much more anything "like turning his efforts into ridicule when he "fails, or punishing him for involuntary "awkwardness. Nor must he be required to "maintain a strictly military attitude in these "exercises, which will only uselessly fatigue "him, as far as our object herein is concerned; "nor must we check too severely those spon-"taneous manifestations of enjoyment and "humorous delight which he may betray, "since they are but the natural and, indeed, "fortunate results of the exercises when pro-"perly directed. In conclusion, we must not "expect more than regularity, precision, and "relative perfection in these exercises, to "which a military form has been given merely, "to facilitate their study and their application "to the whole army."

The men being drawn up in fatigue dress, and in squads of ten or fifteen, commence with those exercises calculated to impart suppleness to the entire body. They consist of turning the head to the right or left, forwards and backwards, and *vice versâ*, the body always maintaining the erect position. Then the body is bent forward, the arms are raised vertically and sideways with and without bending them, flung out singly and together with fists clenched, or circles are described from the shoulder, the arms being the radii. It has been said that French soldiers march more easily than those of any other nation, and this is attributed to the superior training which they undergo. There are three cadences or rates of marching in the French army. 1, The moderate cadence, consisting of seventy-six movements per minute; 2, the quick cadence of one hundred and fifty; and 3, the running cadence of two hundred movements per minute. In all the marching exercises the head, arms, and body have to be kept perfectly in their natural position; and the great desideratum sought is by bringing the toes to the ground first, to avoid that shaking of the spine and its consequently distressing action on the brain and lungs which invariably happens when the weight of the body is thrown upon the heel; a rhythm is given to the performance and a beneficial action exerted upon the chest by the men being made to repeat *one, two,* as each foot respectively touches the ground. The maintenance of the equilibrium is secured by causing the soldier to stand alternately on the right and left leg, bending in each case the other against his body with locked fingers, standing on one leg with the other bent behind, or by coming slowly to the kneeling position, then springing up smartly, flinging the arms suddenly above the head, the nails turned inwards, and, lastly, by bending forward or backward, or to the right or left, on one foot. The full developement of the muscles is secured by a variety of means. At the word of command the men smartly strike the breast with the left and right hand alternately—strike out as in boxing—support cannon-balls in one or both hands with arms extended—fling an iron bar grasped in the middle—support, poise, and swing a heavy club in every variety of position. As a preliminary to leaping exercises, they are made to hop on the right or left leg singly, and then alternately on both, to walk on the heels alone or on tiptoe, and to give the body its proper inclination in ascending and descending, by being carefully trained to throw the weight of the body in the former on the toes, and in the latter on the heels. Wrestling in every possible form is systematically taught. The men, provided with short cords, to the ends of which appropriate handles are attached, pull against each other in pairs or in groups; or two sit on the ground, close the legs feet to feet and sole to sole, and then, with the cord just mentioned, strive each to raise the other. The victors then go through the same exercise with each other, until only two remain, the strength of whom is ascertained by a dynamometer, and the results are carefully noted. The last preliminary exercise consists in causing the men to pull against each other, in pairs or groups, against a fixed point or a dynamometer which will indicate the force of the combined pull. Most of these exercises admitting of a rhythm or cadenced sound, such a practice is encouraged, which not only imparts animation to the scene, but tends to increase the power of the chest; and, as the harmonious utterance of martial sentiments and patriotic songs tends greatly to promote the *morale* of the soldier, singing is systematically taught in the French army; and it is said that even difficult concerted pieces are so accurately sung, that an eye-witness of one of these exercises declared "that the whole seemed, as it were, an organ "of human stops, alto, tenor, and bass har-"moniously blending."

The preliminary exercises being mastered, the men are next drilled in "applied gym-"nastics," and here, if possible, still greater caution is exercised to preserve the men from the danger arising from imprudent efforts, an unhealthful spirit of rivalry by emulation, and the discouragement apt to follow from repeated failure. No leaping requiring violent effort is permitted in cold weather, nor is any

man not perfectly disposed required to practise leaping at any time. The object of the leap must be increased gradually, and a downward leap must never exceed sixteen feet.

At the word "attention" the soldier prepares for the exercise, at the word "forward" he closes the points of his feet, then at the word "leap—*one*," he stoops in his lower extremities, slightly raising the heels, stretching his arms to the rear, with the fists clenched; he then rises again, his arms hanging naturally down. At the word *two*, he repeats the movement. At *three*, he recommences the same movement, vigorously stretches the hams, throws his arms forward, leaps the distance or over the obstacle, falls on the point of his feet in a stooping posture, and then resumes the position of attention. The same principle is observed in all leaps, the position of the arms simply being changed according as the leap may be to a height, downward, or forward and downward. The running leap is similarly performed, the pace being quickened up to the moment of making the spring, which, where excellence is obtained, usually carries the body a distance of from fifteen to twenty feet. This power acquired, it is practised by the men in heavy marching order, that is, with their arms and baggage; but in such cases the downward leap is restricted to thirteen feet, and great care is taken so to adjust the arms that neither they nor the men may be injured. Advanced to this stage, the very difficult exercise of leaping from or to a body in motion, or both bodies in motion, is taught, the principle being that the body in oscillation must be quitted as it is rising, and that the leap to a body in motion should be made as it is sinking.

The soldier is familiarised with nine rules, which he is taught to apply spontaneously in those circumstances where leaping may be required unforeseen, and prompt decision rendered necessary. 1. To form a rapid judgement of the obstacle, and also of the ground on either side of it. 2. During the leap to restrain the breathing, and to make the expiration of the air with which the lungs have previously been filled the moment he reaches the ground. 3. In leaping where width and height have to be overcome, to fling out the clenched fists in the direction the body is to take, so as to augment the impulse given by the legs. 4. In downward leaps to raise the arms vertically as soon as the body begins to descend. 5. During the whole time of the leap to keep the arms in the parallel position they have at its commencement. 6. In forward or wide leaps to incline the body forward. 7. To fall on the point of the feet, the legs close together, bending all the articulations of the body from above downwards. 8. To avoid too rough a fall, by giving to all the articulations a general and supple setting up, so as to make a light bound on landing. 9. On landing, to avoid all useless motion, and allow the muscles to relax, as their continued contraction and rigidity would interfere with the equilibrium of the body. Leaping with poles is practised, the shortest being about the length of a rifle, and the longest about twelve feet. Skill in this style of leaping depends upon the energy of the effort and the length and rapidity of the run. Perhaps one of the most useful exercises to the soldier is that training which enables him to suspend the body by the hands, the elbow, the legs, or by one hand, one leg, or even one finger; great strength of muscle is the necessary result, apart from its advantages in certain military operations. Raising himself up a rope "hand over "hand," walking, running, poising, meeting and passing on horizontal beams, raised at different heights from the ground, without a balancing pole, with the beam inclined or set in motion, are parts of the every-day drill in the French army. Little Nathalie and Blondin's are only extraordinary manifestations of what every soldier in the French army is taught as a necessary part of his military education. The principles of the art of swimming are so successfully explained, the various positions and motions the body should assume and make in the water, that it not unfrequently happens the men can swim the first time they enter the water.

Great scaling ability is essential to every soldier, and in this matter particular attention is paid to the education of the French army. By nine different modes the men are taught the use of the scaling ladder, whether of wood or rope, and, where such ladders are not at hand, to apply the tent-pole, or any other pole, as a means to enable them to scale the walls of an enemy; nay more, as a result of the strength imparted to the muscles and joints by the suspension-bar exercise, they are trained to mount the parapet of an enemy by means of the feet, hands, and fingers alone. The walls of every beleaguered city, or the front of any battery that has been stormed, will be sure to present on its surface indentations produced by the shot, shell, and bullets of the besiegers. By means of these holes the French soldier is taught to raise himself like a cat or a monkey, so as to mount the parapet and commence the hand-to-hand encounter with his foe; nay, should no such *points d'appui* present themselves, then the men are trained to overcome the obstacle by making pyramids of themselves, and mounting, "in the twinkling of an eye," by means of each other, to the point so honourable in the soldier's estimation. The trapéze of the acrobat has been introduced as affording an excellent means of strengthening the arm and the eye, and imparting that very necessary quality self-reliance, and it is said that some of the swinging leaps made by the men are simply "prodigious." A soldier is required not only to be capable of bold daring and rapid movement, but also to undergo laborious exercises of another character. These are not overlooked in the gymnasium. The men are trained, by judicious gradations, to carry at the top of their speed all the implements of war, such as fascines, sand-bags, gabions, projectiles, &c., or sacks filled with sand, each sack weighing fifty pounds; also ladders, beams, caissons; to drag gun-carriages, to improvise litters, to carry with rapidity and skill the wounded from the field. They are also practised in the elements of boxing and fencing, and in sword and bayonet exercise. The cavalry are, moreover, drilled to leap on their horse from the rear whilst galloping, to leap over a hedge or barrier together with him, the man being on foot and holding the reins: few, perhaps, attain to this, but those who aim high never hit low.

It is some such system as this we should like to see adopted in our own army, and applied, with certain modifications, as a necessary part of physical education in our colleges and public schools; nay, we would go farther, and urge the erection of suitable gymnasia in all our large towns, and, where the district is sufficiently populous, in the various townships of the country. *Cui bono*? it may be asked. What are the advantages which would accrue? These we will now consider, both as regards the soldier and the civilian.

1. As regards the soldier: As before noticed, it has been said the mortality is greater in the British than in any other army in Europe. There is no need that it should be so; in fact, if such be the case, it is a national disgrace. No soldier is better fed, better clothed, and, we may say, owing to our recent barrack improvements, better housed, than the British. Why, then, this mortality? Considered merely in a sanitary point of view, we think the adoption of a judicious system of gymnastic training as an essential element in military education would have a tendency, not only to develope the physical powers of the soldier, but greatly to prolong his life. What is the present routine of a soldier's life in barracks, at home at least? A few hours' drill a day, parade, and then many unemployed hours, the *ennui* of which the soldier seeks to remove by a visit to the canteen, or to the lowest class of beer-houses, and even to still more questionable places of resort. That very great and important steps have been taken by the authorities to improve the physical and moral condition of the soldier is undeniable; such as the formation of camps, the establishment of schools, libraries, and savings' banks; and great good in special instances has no doubt resulted: but temptation follows the soldier to the camp, and much money that might, under an improved physical training, be saved, is squandered in yielding to these temptations. Book-lore can never become a general object of pursuit in the army; the men who enlist are generally from that class who have not had the advantages of elementary education in early life, and have, consequently, little or no taste for learning; moreover, those who may, have but a very faint gleam of hope of being able thereby to raise themselves from the ranks, let their acquisitions be never so varied and solid. All soldiers, however, would delight in those exercises which would give them a physical superiority; they would recognise in them objects worthy of a soldier's best study; they would strive to excel; their minds would be relieved from that *ennui* which now oppresses them; and, in the same ratio, the temptations of the canteen and the town would become weakened. Men so trained would be physically stronger, morally elevated, and, as a necessary consequence, longer lived.

But the three hundred various gymnastic feats and practices in the French army are pursued with the direct object of specially qualifying the men for the possible and probable casualties of war, and they succeed in imparting to the men that self-reliance, and that important self-conceit of their own powers, that, believing themselves to be the best soldiers in the world, they invariably enter upon the field of battle with the conviction that they can conquer, and, with such a consequent determination to do so, that the victory with such men is half gained ere the din of battle has begun.

In ancient warfare, the hand-to-hand struggle decided the conflict. The invention of gunpowder and the use of artillery subsequently caused battles to be fought at an increased distance between the combatants; but it is now more than probable that the very perfection to which *armes de precision* have been brought, will render it necessary either to limit the use of the rifle and rifled field-pieces, or to trust more and more to the daring, skill, and, comparatively speaking, independent action of the troops. Accuracy and long range are the great advantages of modern arms; but these have been purchased at the expense of a flat trajectory and greater penetrative qualities at short ranges. The great curvature of the trajectory renders an exact estimate of the distance an absolute necessity in the use of the rifle. Amidst the din, confusion, and smoke of battle, the air filled with the yells of the combatants, the shrieks of the wounded, and

the groans of the dying, he must be more than man who can coolly sight his object and take that deliberate aim which the rifle requires; nor will it be practicable so to train any body of men as to calculate the shortening of the distance between them and their enemy by the movements of the latter, or their own, as to insure a fatal fire. "The modern arms," said the Emperor of the French in the Italian war, "are dangerous only at long distances." Such a distance may be overcome by a variety of stratagems before the opposing force has time to obtain the range; whilst, supposing the range to be obtained, and a volley fired, a re-adjustment of the sight would be necessary preparatory to a second discharge; and how is this to be done when the enemy, perhaps shrouded in smoke, is momentarily changing his position? It has been said that a body of cavalry dashing down upon a square would be advancing, when 500 yards distant, at the rate of four yards per second, and that *seven seconds* would suffice to carry them over the *dangerous space*, supposing the commander of the square to order the rifles to be sighted for 500 yards! It is clear, therefore, that the advice of General Trochu in the Italian war was sound. "If "you are charged by cavalry, wait till they "come up to forty paces, then fire and be ready "with the bayonet." Now, that soldier will be the best qualified to act under such circumstances that has, in addition to a judicious and sound course of training in the use of the rifle, been made most self-reliant and skilfully active by such a course of gymnastics as is prescribed in the French army.

2. As regards the civilian, the advantages will be at once apparent; leaving out the pipe-clay, or what is purely professional, would not the establishment of gymnastic institutions, as we have recommended, be an advantage to the country at large? Instead of the constantly-rising complaint, that owing to the injurious effects of many of our manufactures upon the health of our artisans, and the physical deformity and premature decrepitude consequent upon the children of the working classes being sent too early to injurious trades, we should be able to pride ourselves upon a stalwart, athletic race, with an increase of that self-reliance which is the glory of our countrymen, the bills of mortality would show increased longevity, and the morals of the people would be improved.

MILITARY DRAWING AND SURVEYING.*

It is no longer possible to obtain a commission in the army by means of wealth or influence alone. Every candidate must qualify himself for the profession by a course of study by no means light. Among other subjects which it is compulsory upon the candidate to know, are military drawing and surveying; the latter cannot be readily or efficiently acquired without a knowledge of the former; moreover, surveying requires practical instruction, whereas drawing may be acquired by the silent teaching of clearly-defined principles and rules, accompanied by well-executed examples. Such a work has been provided by Captain Patterson; and young gentlemen preparing for the army cannot possibly have a better guide to aid them in the work of self-instruction in this most important branch of their studies. To such we recommend the work, and, at the same time, take the opportunity of saying, that everyone studying the delightful art of sketching, either as a pastime or with a view to its exercise as a profession, apart from military life, will derive much instruction from the lucid observations of the gallant author.

* A Treatise on Military Drawing and Surveying, with a Course of Progressive Plates. By Captain William Patterson, Professor of Military Drawing at the Royal Military College, Sandhurst. Trübner & Co., London, 1862.

HORTON'S TIMBER, STONE, AND SUPERFICIAL TABLES.*

Architects, surveyors, and all persons requiring readily to ascertain the superficial or solid contents of unequal-sided, square-sided, octagonal-sided, or round masses, will find these tables exceedingly useful. They have been calculated with great care, are printed in bold clear type, and form, with the rules, explanations, &c., a compact small 8vo. volume of 319 pages. The errors of previous formulæ are distinctly pointed out, and the work is destined to supersede the erroneous books now in use, in which the popular work by Hoppus must be included. Everyone requiring such tables should at once purchase the book; and we endorse the opinion of Rees, quoted in the introduction, that as "Government has, in some instances, come forward to fix a standard of measure, as in corn, coals, land, &c., and as old prejudices can never be so successfully combated as by the authority of enlightened legislators, it is to be hoped that we may some day find this, and other topics of a similar nature, become the subject of Parliamentary investigation." The work is dedicated by permission to the Right Hon. Milner Gibson, M.P., &c., which is in itself a guarantee of its intrinsic value.

* The Complete Measurer. By Richard Horton. London: Weale, 1862.

THE ATLANTIC TELEGRAPH.

The *Times* of Monday last contained the following paragraph:—

"It will be recollected that some months since, at the instance of the Atlantic Telegraph Company, the Lords of the Admiralty ordered the paddle-wheel steam surveying-vessel Porcupine, 3, to be prepared for sounding that portion of the bed of the ocean, near Ireland, on which the electric cable, laid by Sir Charles Bright, is supposed to have broken. Officers of experience were appointed to undertake this important duty, and an efficient crew was selected from the surveying-ship Fisgard, 42, at Woolwich. The Porcupine was supplied with ample sounding machines, including those of the Bulldog pattern, which bring up some of the bottom each time they are used, and with a donkey steam-engine on deck for hauling them on board. The Porcupine left Plymouth for the scene of her labours on June 22, arrived at Galway on July 9, and departed therefrom on the 21st. She proceeded to what is termed the Cliff, about 200 miles west of Galway, and during her operations there experienced a heavy gale of wind, which carried away her rudder head. The Porcupine put back to Galway on July 26, had her rudder repaired, and on August 6 sailed for Rockall Bank, some 500 miles north-west of Donegal Bay, where she arrived on the 14th, and after remaining two days went into Killibeg's Harbour, Donegal, for fuel, and departed on the 24th for Queenstown, which was reached on the 30th. After staying till the 3rd inst., she returned to Plymouth. One of the objects of visiting the Cliff was to ascertain the exact nature of its declivity, considered to be above 1,200 fathoms in eight miles, or a fall within that distance from a depth of 550 fathoms to a depth of 1,750 fathoms. It is stated that the officers by sounding crossways have also discovered what the seamen term a 'gap,' through which a wire could be laid with less risk than where Sir Charles's wire was laid. They also discovered a steeper cliff, which they have named the Porcupine Rock. Some of the soundings extended to a depth of 2,500 fathoms. The visit of the steamer to Rockall on August 14 seems to have been prompted by a desire on the part of the Lords of the Admiralty to be able to judge by a knowledge of its depth and character of the expediency of dropping a cable across this bank, for the purpose of connecting Ireland with Iceland and America. On the ridge of the bank soundings varied from 90 to 160 fathoms; fish were most abundant; the bottom consisted of mud and sand. It is reported to be the opinion of several of the officers on board the Porcupine that a line of communication which can be established without the necessity of so long a wire as that direct across the Atlantic will be much more likely to succeed. A system of comparatively short lengths can be repaired with less difficulty in case of injury, besides which it is believed that with the present limited extent of telegraphic science there is no means of transmitting a message rapidly through a great length of wire. One word is said to overtake another, and it is averred that the force requisite to be exerted by the batteries for sending the fluid so great a distance must involve injury to the wire by the necessary intensity of the electric spark. The diagrams, returns, and reports from the officers engaged on board the Porcupine leave this afternoon for Whitehall for the consideration in the first place of the Lords of the Admiralty, after which communication will be made by their Lordships to the directors of the Atlantic Telegraph Company. The vessel is now at Keyham steam-yard, where she will disembark her sounding gear and machinery, and re-ship the deck-house, or office, displaced for the purposes of her recent duty. She will probably leave on Wednesday for Woolwich."

THE INTERNATIONAL EXHIBITION.

Fuel.

All substances used as fuel are of vegetable origin. There are three distinct varieties of fuel—namely, wood or other vegetable matter, peat, and coal. Everyone has seen a peat bog, which is obviously the result of the accumulation and natural decay of various plants. The bogs of Europe are chiefly formed of certain species of mosses, but in India and some other localities peat is derived from other kinds of plants. If a bog is examined it will be found that the degree of decay is proportionate to the depth: thus, at the surface the peat may consist of the tangled and only slightly altered remains of its component plants; while at the bottom, especially if the bog is deep, it may be a black earthy compact mass, presenting no sign of vegetable structure. Now, it may be shown that all coal, like peat, is the product of the natural decay of vegetable matter. It would be easy to select a series of analyses of peat and coal of various kinds which would illustrate in the most striking manner the gradual change in composition from wood to anthracite, which is the ultimate stage of decay, and consists almost wholly of carbon. Vegetable matter may be regarded as *virtually* composed of water, carbon, a small quantity of hydrogen not in combination with oxygen, and about 2 per cent. of ashes. Part of this water is only present like water in sponge, and may be easily expelled by heat; but the rest exists in combination as an essential part of wood. It is not, however, pretended that the oxygen and hydrogen forming this latter part are actually combined in the state of water. The heat produced by the combustion of wood is derived solely from the carbon, and from the hydrogen in excess beyond what is required to form water with the oxygen present. All the water supposed virtually to exist even in the driest wood not only does not yield heat, but occasions considerable loss of heat, inasmuch as it must be evaporated during combustion at the expense of the heat developed by the burning of the carbon and the excess of hydrogen above-mentioned. These remarks apply equally to peat and coal. It has been ascertained by experiment that the oxygen in these fuels may practically be considered as in combination with hydrogen in the state of water, in so far as relates to generation of heat. The ultimate products of the *perfect* combustion of fuel in atmospheric air are water and carbonic acid; but, if the combustion is not perfect, various secondary products are formed, such as tar, hydro-carbons, &c. When wood, peat, or coal is exposed during a sufficient time to a red heat in a close vessel, like a retort, combustible gases and vapours are driven off, leaving a black residue, which in the case of wood and peat is termed charcoal, and in

the case of coal is termed coke—substances with which everyone is familiar. Even in open fires charcoal and coke are always formed after short ignition. When charcoal or coke is burnt in atmospheric air, carbonic acid is immediately formed; but when this gas passes through a stratum of redhot carbon more than a few inches in depth, it takes up a portion of carbon, and is converted into twice its own volume of a combustible gas termed carbonic oxide, which burns with a beautiful blue flame, producing carbonic acid. Hence, in any furnace or closed fireplace having a grate at the bottom, and containing red hot fuel, carbonic oxide will always be formed, for there is a continuous current of air upwards through the grate, and, as has been stated above, carbonic acid is always the immediate result of the contact of atmospheric acid with incandescent carbon. Carbonic oxide gas gives out on combustion a very large amount of heat, and is now applied with the greatest advantage to many important purposes. If, through an imperfect supply of air, much of this gas is allowed to escape into the furnace chimney, as is frequently the case, there will be a great waste of fuel. We are anxious to fix particular attention on this gas, as in the sequel we shall have occasion to point out very valuable applications of it in metallurgical operations connected with iron. We cannot in these columns enter into much detail on the subject, however important it may be, but we earnestly advise our metallurgists to lose no time in studying what has recently been written on the matter.

The first subject which naturally presents itself for special consideration is peat. Not much is to be learnt from the display of mere lumps of raw peat; yet in the present Exhibition there are several illustrations connected with peat of great practical interest. There is only one metallurgical process in Great Britain in which, so far as we are aware, peat is directly applied as fuel, and in that only partially—namely, the smelting of lead in the "ore-hearth." This method is extensively employed in the North, and in the case of rich ores is maintained by some experienced smelters to be superior to every other. It is a singular circumstance that in former times it was practised successfully in Derbyshire, where it became extinct; and that attempts to reintroduce it into this county have signally failed.

In the state in which peat is usually obtained after desiccation in the air, it is quite unfit for the smelting of iron and various other metallurgical operations. It is a light, porous substance, which, in comparison with other kinds of fuel, contains only a small quantity of combustible matter in a given volume. Very numerous attempts have been made to render it more generally available as a fuel, both in this country and on the continent; and the records of trials which have been published on the subject are not a little conflicting. Peat has an extensive literature of its own, which is amusing as well as instructive. All attempts hitherto made to render peat suitable as a fuel for metallurgical purposes have had reference either to its condensation, by compression or otherwise, or to its carbonisation. In order to effect the compression of peat, numerous contrivances have been devised, and, as usual, patented; and at the present time much attention is directed to the compression of peat. The peat is reduced to pulp in a sort of pug-mill or other suitable machinery, and is afterwards drained and moulded into brick-shaped pieces, either with or without pressure. The peat thus acquires great solidity and a much higher specific gravity. But this treatment is necessarily so expensive as to render its adoption impossible where coal abounds. In some countries, however, such as Sweden and Bavaria, it is practised with success. In Bavaria, peat bricks are extensively used under locomotive boilers, and in Sweden Ekman has long employed peat in his gas-welding or reheating furnaces; it is fashioned into bricks, and subsequently dried by artificial heat at a temperature almost sufficient to cause incipient charring. Under No. 21, in the Swedish department, will be found specimens of iron manufactured in such furnaces, with prepared peat as the fuel, by Baron Hamilton, Nericia, at whose works the annual consumption of peat for this purpose is between 600 and 700 tons. In the Italian department, Gregorini exhibits steel made in a gas-puddling furnace with peat and lignite as fuel, No. 52. Furnaces constructed on this principle, whether for the use of peat or other kinds of fuel, are well worthy the attention of our ironmasters and other practical metallurgists who are interested in economising fuel. We have a strong belief, which has grown with the experience of many years, that these furnaces will one day—and that not far distant—play an important part in the metallurgy of this country. Without the aid of diagrams it is impossible, we fear, to present such a description of them as shall be satisfactory to the general reader. We will, however, make the attempt; but we must assume that he is acquainted with the form and action of a common reverberatory furnace, such as may be seen in operation in many parts of England. Instead of the usual fire-place, there is what is called the "gas generator." This consists of a circular chamber of fire-brick several feet deep and two or three feet in diameter, closed at the bottom, and having a hopper at the top, through which fuel is supplied. This chamber, at a certain height from the bottom, is in direct connexion with the body of the furnace, so that flame may issue as freely from it as from the fire-place of an ordinary reverberatory furnace. In the sides of the generator, at a certain distance from the top, are a series of three or four small round holes on the same level, and at some distance lower down is another similar series of round holes. These holes are for the passage of the air intended to support combustion in the interior of the generator, which is blown in either by a fan or some other convenient blowing machine. Now, when the generator is full of incandescent fuel, and air is injected through the lateral holes, carbonic oxide gas is copiously produced and passes into the furnace, as there is no other place of egress, the hopper at the top being supposed to be shut. As it escapes from the generator, it is met with a current of heated air, or, as it is technically termed, "hot blast," which is injected downwards from the roof of the furnace at or near its junction with the generator, either in several jets or in one continuous sheet. The carbonic oxide while still hot is thus burnt, and the heat developed is sufficiently intense even to melt wrought iron by the hundredweight. The air which supplies the generator is also previously heated; and, in the Swedish furnaces, the apparatus for heating the blast consists of a series of cast-iron pipes fixed at the lower part of the stack. Hence, only the waste heat of the furnace is employed for this purpose. It is usual to place a hollow cylinder of iron round the generator, so as to leave a closed space between its internal surface and the exterior of the generator; and into this space the hot blast is introduced, whence it passes through the two rows of holes previously described into the interior of the generator. The atmosphere of such a furnace can be rendered either reducing or oxidising at will by regulating the amount of blast. At the bottom of the generator is a door, by means of which the ashes or clinker from the fuel may be withdrawn. These furnaces can be so modified as to suit any kind of fuel. We have the conviction that they would be well adapted for the free-burning coal slack of South Staffordshire and South Wales, of which enormous quantities continue to be wasted, and especially for anthracite. This kind of coal gives intense local heat; but this inconvenience might easily be remedied by introducing along with the air into the generator a certain proportion of steam. This steam would be decomposed with the formation of carbonic oxide and hydrogen gases, and some carbonic acid, and a considerable reduction of temperature would be the result. But the heat thus removed from the chamber would be subsequently restored in the body of the furnace by the burning of the combustible gases derived from the decomposition of the steam; so that there would be no loss of heat, but only a transference of it from the generator, where it is not wanted, to the furnace where it is applied. We are induced to occupy so much space with this subject, because we believe it to be of great practical importance to this country, and because ineffectual attempts have been previously made to attract the attention of ironmasters and others to its consideration. The fact is, our mineral fuel has been so abundant, and so easily accessible, that it has been most cruelly wasted. But matters are not quite so smooth as they used to be, and necessity is beginning to compel attention from our ironmasters to the subject of economising fuel in every possible way. The old reverberatory furnace is only a clumsy sort of gas furnace; but in those such as we have just attempted to describe, the fuel is converted into combustible gas, which may be applied under most advantageous conditions. It would be possible to generate carbonic oxide to any extent at a cheap rate, and to lay it on to houses for use as fuel, much in the same way as coal gas is now supplied for illumination. Indeed, it is daily so applied in many of our large ironworks, and with the best results. There would, of course, be many practical difficulties to overcome in rendering it subservient to domestic use; but there is no reason to apprehend any insurmountable obstacle. It would be probably necessary to have numerous gas generators distributed here and there in the case of large towns. It must be borne in mind that this gas has no offensive odour like that of coal gas. Fancy a smokeless London! The smoke of London is chiefly caused by domestic fires. This is not a mere chimerical notion. We believe the thing to be possible, and that one day this desirable result may be attained through the agency of gaseous fuel, though we may not live to see this devoutly-to-be-wished-for consummation. But a patent stops the way. Some years ago a monopoly was granted for such an application of gaseous fuel to an individual, who, we will venture to affirm, has never made an experiment on the subject from that day to the present, if, indeed, at any time before. Suppose any enterprising person were to succeed in bringing that scheme to a successful issue, and to apply it practically, the patentee, armed with all the terrors of the law, might pounce like a vulture on his prey, and carry off the spoil. Such is our present patent law, which, it is to be hoped, will be purged from its manifold defects during the next Session of Parliament.

Many attempts have been made to substitute peat charcoal for wood charcoal in the smelting of iron; and some time ago we were informed that an experiment of this kind was about to be again tried in Ireland. We examined some of the charcoal, which was dense and resisting, and yielded a white residue on incineration. The promoters of this undertaking were sanguine of success. We sincerely hope they will not be mistaken, though we must confess that under the existing relative conditions of Great Britain and Ireland we have strong misgivings as to the result. The machine which it was proposed to employ may be seen in operation in the Western Annexe, No. 1,562. It is described as Brunton's in the official catalogue; but the attendant assured us that it was the invention of a Mr. Buckland, formerly of the Maesteg Iron Works, South Wales. It consists of a solid obtuse iron cone, having a spiral groove on its exterior, and revolving vertically within a hollow cone of iron plate perforated everywhere with small round holes just like a colander. The peat is put into the space between the solid and hollow cones, and by the revolution of the former is forced in worm-like pieces through the holes in the latter. Thus prepared it is fashioned into bricks by any convenient machine, of which one is shown in juxtaposition. The bricks are artificially dried, and portions of them which are exhibited are solid and resisting. Peat charcoal prepared from them is also shown. A series of these specimens will be found in the Eastern Annexe, No. 43. Moulded peat charcoal and various products obtained from the destructive distillation of peat are exhibited in the same Annexe, No. 240. Some years ago, it may be remembered, very sanguine views were entertained and promulgated as to the great industrial advantages which were likely to accrue to Ireland by the manufacture of paraffine and other products

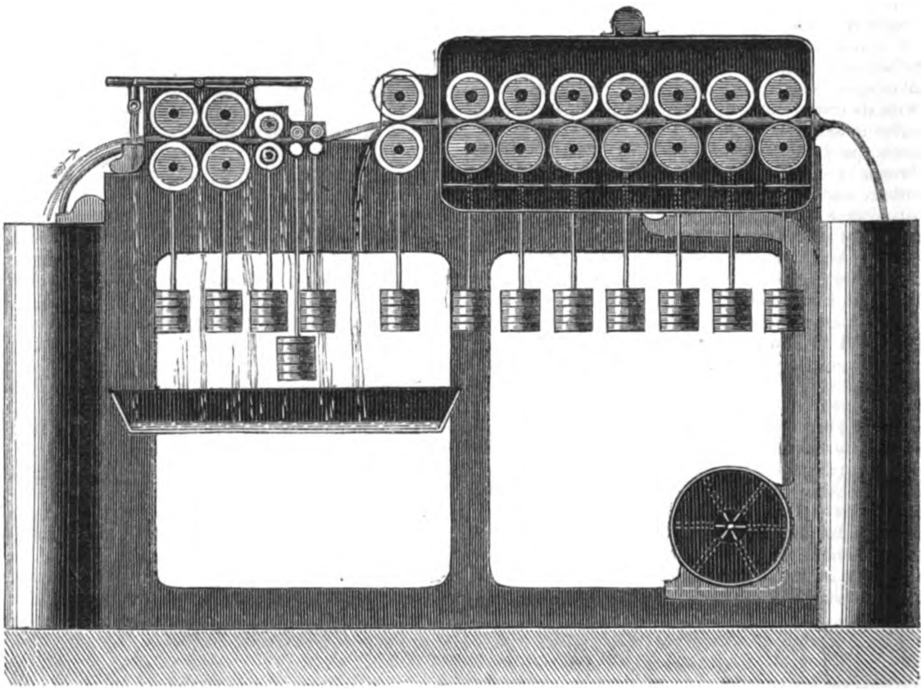
from peat. The present Exhibition is rich in examples of this exquisitely beautiful substance, which is delicately white, inodorous, and insipid, and which is now extensively employed as a substitute for wax in candles. It is obtained from certain varieties of coal, such as *cannel*, by distillation at a low temperature; and, though some might be produced by similar treatment of peat, yet the quantity would be very minute compared with what would be yielded by the above-mentioned varieties of coal. Attempts were actually made on a considerable scale in Ireland to manufacture this and other substances from peat, and the result was, commercially at least, unsuccessful. Anyone who wishes to inform himself on this subject may consult a small Parliamentary blue-book, with the following title:—"Report on the Nature and Products of the Process of the destructive Distillation of Peat, considered specially with reference to its Employment as a Branch of Manufacturing Industry. Made to the Right Honourable the Chief Commissioner of Woods, by the Director of the Museum of Irish Industry. April 8, 1851." In this period of crippled trade and cheap money, all sorts of schemes of "profitable investment" may be proposed to the British public, and among them, possibly, peat-bogs may be presented as inexhaustible sources of wealth. These bogs are often very extensive and deep, and in the present condition of this country with respect to mineral fuel are more likely to swallow up treasure than to yield it.

We now pass to the consideration of coal. Everyone fancies that he knows what coal is, but let anyone try to define it, and he will find himself immensely puzzled. In proof of this difficulty we may refer to the famous Torbanehill case, which was tried at Edinburgh in 1853. The published report of this trial occupies 246 quarto pages, and the point at issue was a definition of coal. A host of witnesses were examined, including many of the leading scientific men of the United Kingdom, and never was testimony more hopelessly conflicting. An agreement as to the exact meaning of the term coal was quite out of the question. The Judge took the commonsense view of the case, and properly ignored the so-called scientific evidence altogether. Some men of science, it is to be regretted, are too apt to present themselves in courts of justice as advocates, and not as impartial witnesses. This ought not to be. That which is a duty on the part of a legal professional advocate is a disgrace to men of science. We have heard evidence given by so-called men of science, sworn to speak the truth to the best of their knowledge and belief, which made us blush for their dishonesty. It is high time that the true followers of science should combine to put an end to the disreputable practice which at present exists. We have discussed this subject with members of the Bar, and even of the Bench, and we find that a strong opinion prevails as to the necessity of alteration. But what is to be done? Would it be desirable that the Court should appoint its own scientific witnesses, instead of relying upon the too often interested testimony of the witnesses subpœnaed by principals in an action at law? There are, no doubt, objections to such a course, but we venture to raise the question, which is one of great importance, especially in connection with patent law amendment.

Some years ago we were present at the Geological Society of London, when a discussion arose as to the definition of "coal." Sundry bad jokes were made, such as references to *Burns' Justice*, *Coke upon Littleton*, &c., when the distinguished Professor of Geology at Oxford put an end to the debate by stating—"Gentlemen, what we call coal in Yorkshire is raised from the bowels of the earth, is used as fuel, and sells for 5*s.* a ton."—*The Times.*

Three reefs have just been discovered amongst the Friendly Isles in the Pacific; two were discovered by Her Majesty's sloop Pelorus, and the other by a whaler. The sea is quite warm in the neighbourhood of the reefs, and sometimes appears like a boiling cauldron, which proves subterraneous fires are near.

MARSHALL'S MACHINE FOR THE PREPARATION OF FLAX, &c.



The object of this invention is to effect a better and finer division or separation of the fibres of the material to be spun. For this purpose, the flax, hemp, or other material is passed either whilst in the raw state, whether before or after being steeped, or when in a continuous sliver after having been heckled or carded between several pair of rollers, with an increasing draft as the material advances. This is effected by giving an increased rapidity of revolution to the second pair of rollers through which the material passes as compared with the first pair, the third pair in like manner revolving more rapidly than the second pair, and so on, constantly increasing the rapidity of revolution of the rollers as the material advances. The number of pair of rollers to be used, and the distances between the several pair of rollers, will be varied according to the requirements of the material to be operated upon, and the subsequent operations to which it is proposed to subject it. In addition to passing the material through the rollers, it is saturated thoroughly with water or other suitable fluid. After the material has been thus treated, it is dried and softened by passing it between rollers heated by steam or other suitable means. With this an apparatus may be combined for forming the material by well-known mechanism into a lap suitable for feeding it on to carding engines.

ON THE REMAINS OF EARLY BRITISH TIN-WORKS.

At the annual meeting of the Cambrian Archæological Association at Cornwall last week, Dr. Barham read the following interesting and valuable paper on the Remains of Early British Tin-Works:—

These notes by no means represent the subjects which I desired to lay before the meeting: they are but a slight outshadowing of them, and I place them in your hands simply to call attention to a few points which appear to me to require closer investigation than they have yet received. I shall leave with you the question of the intercourse of the Phœnicians, merely expressing my opinion that a great mistake has been made in supposing the Scilly Islands to have been the *Cassiterides.* There does not exist in the islands any indications of ancient tin-workings. I cannot learn that any tin has ever been found in any of the Scilly Islands. I know that small veins of schorl have been mistaken for tin. The appearance, however, of Cornwall from the sea is such that it might easily have been taken for a group of islands; and when we have the evidence of the Hereford map to show how imperfect geographical information was at a much later date, when even the Principality of Wales was supposed to be a separate island, we can, without much difficulty, admit that the term was applied generally to Cornwall. The evidences of very ancient tin-workings are still to be found in many parts of this county, and of Devonshire. In St. Just, near Cape Cornwall, are some rude workings upon the run of the lodes, and there are still remaining evidences in other parts of that parish, and in the adjoining parishes, which are probably early British. Some of the most remarkable workings in the county are, however, to be found in Gwennap, and in Baldhu. Again, in St. Agnes and in Perranzabuloe there are excavations showing that remarkable want of engineering knowledge which distinguishes all early workings. Around St. Austell we find similar evidences, and again in the neighbourhood of Calstock. Especially at Drakewalls like excavations—open to-day—exist. On Dartmoor these are numerous, and the extensive workings at and near Birch Tor are probably the most extraordinary existing.

Many of the old mine workings belong, without doubt, to the Roman period; and there is evidence that the educated skill of the Romans was brought to bear upon the Cornish tin mines. Many years since, when examining the workings of the lode in Baldhu, I heard of a well-executed adit having been discovered which had been driven up to the lode; and Mr. Enys informs me that he has learnt, on good authority, that "there was a large *arched stone level* in the elvan that runs through the district, very different from any other of the old men's workings, but that it was almost impossible to get near it at present without extreme danger." This description agrees with that of the Roman works in Spain.

Again, numerous "old men's workings" must belong to the reign of King John, when mining for tin was carried on most actively. I have but little doubt that nearly all the perforations in the cliffs of the tin district—such as are seen in a most remarkable manner in the granite at Cligga Head and scattered along the cliffs in St. Agnes and Perranzabuloe—belong to this period. That very extensive mining operations were carried on at that

time on Dartmoor is certain; and evidences of the existence of a large population still remain. The singularly isolated churches on the moor are all supposed to be of this date.

We have, therefore, in dealing with this question, to separate with care the Roman workings and the so-called Jews' workings, from the truly early British excavations. The evidences of sheltering earth-works appear to me to be exceedingly strong in favour of the existence of the most ancient of British mines. One of the most remarkable of these is the Bolster, in St. Agnes, which may be traced from Polbreen to Chapel Porth; and there are many indications of its having been continued in the other direction to Trevaunance, thus inclosing the whole of St. Agnes Beacon, upon and around which tin has been, and is, abundant. Similar inclosures are to be yet traced in St. Just and many other places, and either within or very near these we may generally find that every lode has been worked—by simply clearing it out as far as the primitive miner could follow it—by following every string, however small in size it may have been, and indeed by employing the rudest methods of the untaught mind. Many of the rock castles, and many of the "rounds" could have been constructed for no other purpose than to protect the stores of tin which had been gathered in the neighbourhood of them. I believe we may by a little cautious investigation separate the ancient British workings from those which were directed by the Romans, or those which were carried out by the Jews at a later period. This investigation I desire to open—it is full of interest.

The general tendency of all Cornish antiquarians and historians has been to make St. Michael's Mount the Iktis of Diodorus, from the circumstance that it agrees, at the present time, precisely with the description of the ancient historian. Diodorus speaks not of an island, but of islands, and to these the Britons conveyed their tin. Secrecy as to the localities from which this then precious metal was obtained, was to be preserved. The Tyrian traders were kept on the coast; they do not appear to have been admitted to the mainland. This circumstance explains the construction of such works as the Bolster, the hill castles, the rounds, or, at least, of some of them, and many other arrangements made for secrecy and safety. The means for conveying the heavy ore being necessarily limited, there can be but little doubt that the nearest secure place of shipment would be selected, and perhaps in every case the traders were confined to the islands near the coast. It is not improbable that tin may have been *carried* to the Scilly Islands, seeing that there has ever been a shadowy tradition pointing to them as the Cassiterides. But St. Michael's Mount still preserves the character given to the Iktis by Diodorus, and it was no doubt one of the islands named by the historian, and to it, in all probability, was taken for sale and shipment all the tin obtained in the western district. Seeking for the other islands, two especially present themselves. These are St. Nicholas' Island in Plymouth Sound, and St. George's or Looe Island. At the present time these islands are constantly surrounded by water, but an examination of the Admiralty charts will show that over the "bridge" which connects St. Nicholas Island with Mount Edgcumbe there is, even in the centre opening at low water, only a few feet (I believe only three) of water, while all the other parts are left dry. The rocks which run out from Hannafore Point, by the Midmain Rock, in like manner connect Looe Island with the main, there being but a few feet of water above them at low tides.

We have the evidence of the submarine forest in Millendreth Bay, near Looe; of the raised beach at Redding Point under Mount Edgcumbe; of the submarine forest in the Mount's Bay, and numerous raised beaches around the coast, to support the hypothesis of a change in the relative level of land and water. This is not, however, required to support the view that at one time the two islands named were left with a passage dry from them to the shore. The disintegrating action of the waves, beating on either side of such a neck as that which we supposed to have existed, and the abrasive power of tidal currents, would be quite sufficient to produce the separation, without any raising or lowering of the land. But for the protecting influence of the mass of greenstone, running out from Marazion, called the Hogus, and that which is afforded, also, to some extent, by the elvan dyke forming the Long Rock, especially the other portion called the Bayman, and the interpenetration of the clay slate around the island, by granite and quartz veins, there is no doubt but St. Michael's Mount would long since have been in the position of St. Nicholas and Looe Islands. The proposition which I endeavour to support is, that St. Michael's Mount, St. George's or Looe Island, and St. Nicholas' Island, were three of the islands included under the description given by Diodorus. I think there are others, especially on the north coast of Cornwall, which might be included. That the tin produced by the ancient Cornish people over the western district found its way to St. Michael's Mount; that the extensive district around St. Austell sought for a shipping port at Looe Island; and that the tin obtained from the Calstock and Callington districts, and that collected from the wide range of Dartmoor, was taken to St. Nicholas' Island, in Plymouth Sound.

Sir George Cornewall Lewis has recently been endeavouring to revive the claims of the Isle of Wight. However that lovely spot came to be regarded as the probable Iktis is strange, seeing that it does not agree with any one of the conditions required. Certainly, we have one island which yet preserves all the characters required, and at least two others which may have been in the condition of islands when the tide was flowing, but having passages to the main land at low water; and these will be found, I believe, to be the islands of the ancient historian.

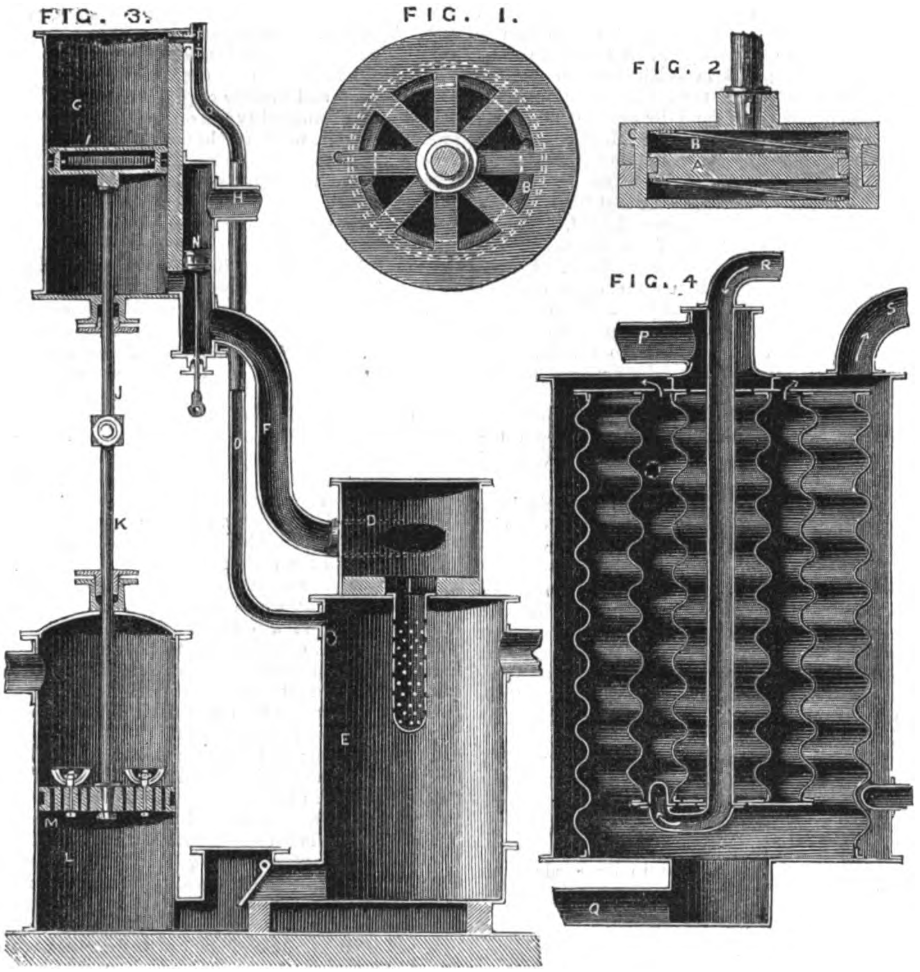
While reading the above paper, Dr. Barham said that there was another island which had not been mentioned by Mr. Hunt, and with which Mr. Hingeston was better acquainted than himself. It was situated near the mouth of the Yealm, and if one of those islands alluded to by Diodorus, it would be convenient for tin from the district beyond Ivybridge in Devon. He had proposed to read some notes on this subject, which would have had reference to the views advocated with much learning by Sir Cornewall Lewis, which tended to the conclusion that the Phœnicians did not themselves come to Britain, but that the trade in tin carried on by them with this and other countries, was through the intervention of the people living on the coast of Gaul. It appeared to him, on examining the argument of Sir Cornewall Lewis, that this opinion was not properly supported; and it seemed to him that it would be interesting, in reference to our ethnology and the character of the early civilisation of the Cornish, to show that the probabilities were all on the other side. He considered that Sir C. Lewis had employed arguments which were of great weight, as tending to throw a doubt that the Phœnicians navigated round the shores of Africa; but these arguments did not bear on the probability of that people having had intercourse with this country, carrying on a coasting trade with Gallicia in Spain, where there were workings in tin, and on the coast of France to some extent, and afterwards coming over to the coast of Britain. The only other people who were navigators at a very early though later period were the inhabitants of the coast of Gaul, but there were not sufficient grounds for knowing whether they traded in tin. The Phœnicians, however, were known to have traded in tin, and taking that fact alone, the probability was more in favour of the impression that the Phœnicians carried on the trade in tin in their own vessels than that they employed Gaulish vessels. That, however, would be one of the points to be considered. There were various others which he should very much like to see taken up by persons competent to do so, in order that they might be brought before the Association in a manner worthy of the importance of the subject. Another branch of the argument was the linguistic branch, which would be elucidated by the terms used by miners in the Celtic countries where mining was carried on. It would be a very strong argument in favour of Phœnician intercourse with this country, if it should be found that the mining terms used by the miners in Cornwall were distinct from those of Wales and other members of the Celtic race. The Phœnician language was little else than pure Hebrew, and it would be a powerful argument if it should be found that Cornish mining terms had a Hebrew and Semitic origin, while those employed in the principality and other Celtic countries producing no tin, were of Celtic origin. Then there were a variety of little things in which Cornwall differed from other Celtic countries which ought to be investigated. There was the article of Cornish cream, which very strangely was confined to the limits of old Danmonia. It was a curious fact, that in the country which was occupied by the ancient Phœnicians, that peculiar cream had been found—on Mount Carmel a traveller was served at a monastery with a dish of Cornish cream. There were also a considerable number of usages, such as the observance of Midsummer Day, and other things, to be considered. Owing to the manner in which his time had been occupied in carrying out the arrangements in connection with the meeting of the Association, he had been unable to follow up the investigation of the subject; but he had thought it right to bring it under their notice. He then called attention to two or three articles which were of considerable interest as having some connection with the early tin trade of the county. The first was a small symbolical image of what was called a bull, but which might just as well be called a lion. It was found while digging the foundations of a school-room at St. Just, and Mr. Birch, of the British Museum, to whom it had been submitted, said that it was the god Apis. It was marked by a crescent on the flank, and similar markings had been used in the time of the Roman emperor Hadrian; and it was considered to be the most distinct article of Oriental manufacture that had been found in the county. The second article was a block of what was called "Jews'-house tin." Mr. Hunt had alluded to the trade in tin carried on by the Jews in the time of King John, but there was doubt as to their being employed in smelting tin in early times. Similar blocks of tin had been found in many of the Jews' houses in the county, but why they had been left he could not tell. He then referred to a leaden image which had been found on Redmoor, not far from Mr. Robartes's, and which had been called a Hebrew image on no better evidence than of its having four Hebrew letters on it. It had been sent for inspection to the Archæological Institute, but Mr. Albert Way returned it the other day, saying they could make nothing of it.

M. SCHAU'S APPARATUS FOR AVOIDING SCALE IN BOILERS.

THE apparatus of M. Schau consists of a cylinder closed on top and connected with the boiler by a short tube. Into this cylinder the feed water is thrown in a shower, so that the heat of the steam brings it instantaneously to the boiling temperature before it reaches the boiler. This rise of temperature precipitates the solid matters which are deposited in the cylinder, while the water in a purified state goes to the boiler. An Austrian locomotive provided with this apparatus ran over 5,500 miles (8,880 kilom.); during which about 45lbs. of a soft material like soap was deposited in the cylinder, while the boiler was kept perfectly clean. This result is the more remarkable, since at the beginning of the experiment it was coated, to a thickness of $\frac{3}{16}$ths of an inch, with a solid crust, which completely disappeared during the experiment.

M. Engerth, State-Counsellor, who presided at the meeting of Austrian Engineers, to which the above was communicated, remarked that it was probably his experiments on locomotives which suggested to M. Schau the first idea of his simple and ingenious apparatus. It is known, in fact, that when the feed-water returns to the tender after being strongly heated, there is formed in that reservoir a considerable deposit, whilst the boiler itself is comparatively free.—*Zeitschrift der Osterreichischen Ingenieur-Vereins.*

RIPPINGILLE'S IMPROVEMENTS IN STEAM ENGINES AND PUMPS.



This invention, just patented by Mr. F. A. Rippingille, of Staple Hill, near Bristol, is applicable to those constructions of steam engines wherein the injection water in its way to the condenser is caused to enter a cylinder, and to act on a piston working therein, so that the power obtained thereby may be rendered available in the working of the steam engine. And the invention consists—1. In applying an elastic piston in the injection cylinder or engine to prevent concussion at the termination of the stroke, and also during the covering of the port by the valve.

2. In applying a chamber or vessel to the condenser in such manner that the injection water from the injection cylinder or engine shall be first received into such chamber or vessel, and then be by it delivered continuously in numerous streams or jets into the condenser, the chamber or vessel being of such capacity, and so arranged, as to retain sufficient water to keep up a supply of water to the condenser during one half stroke of the piston in the injecting cylinder.

3. In applying apparatus for refrigerating the condensed water from a steam engine in combination with an injecting cylinder or engine.

4. In a combined arrangement of air pump and injection cylinder, or engine (by which the air is withdrawn from, and injection water is supplied to, the condenser) with a water pump for withdrawing the condensing water, and condensed steam from the condenser.

5. In a mode of constructing steam engine condensers.

Fig. 1 of the above engravings is an upper view; and fig. 2 a section of a hollow piston, in which a circular disc or inner piston A is placed. The outer piston C and the inner piston A are suitably packed to render them air and watertight. Springs B B are placed above and below the inner piston to keep it in position. By means of the springs the piston is rendered elastic, in such manner that it may yield in place of causing a shock at the termination of the stroke, and when the port or outlet is closed; fig. 3 shows a vertical section of a condenser having a regulating vessel D applied thereto, by which a continued supply of injection water is kept up to the condenser E, there being a perforated tube descending therefrom into the interior of the condenser. The injection water is supplied into the regulating vessel D, which is capable of containing a quantity of water sufficient to continue the injection during the time that no water is being passed from the injection cylinder. Plates are placed in the bottom of the vessel D in order that the water in that vessel may be prevented rotating therein, which it would otherwise be liable to do by reason of the rush of water from the injection cylinder or engine through the supply pipe F. It is preferred to employ the condensed water obtained from the steam engine as injection water after it has been cooled or refrigerated, which however is not new, but according to the present invention apparatus for refrigerating the condensed water is applied between the cistern or vessel into which the water from the condenser is received, and the injection cylinder or engine by which it is supplied to the vessel D, and consequently to the condenser as injection water. The arrangement of the apparatus employed for this purpose is as follows:—The outlet of the pump which removes the water from the condenser is connected with a refrigerating apparatus, and the inlet pipe of the injection cylinder or engine is connected with the refrigerating apparatus, so that the water from the condenser is first refrigerated, and it is then received into the injection cylinder, and from it the water passes into the vessel D to the condenser. The refrigerating apparatus consists of a cylindrical vessel, around which cold water circulates, also an annular cylindrical vessel within the same, having cold water circulating through it. The injection water from the condenser is delivered within the annular cylinder, and passes to the bottom, and then under the annular cylinder; it then traverses the outer side of the annular cylinder to the top of the main cylinder, and, finally, traverses the inner surface of the main cylinder, for which purpose a plate of iron is fixed around the main cylinder, within about one inch of the same, to keep the injection water in close contact with the cooled surface of the main cylinder.

The engravings also show an arrangement or combination of air, an injection pump or cylinder, and a water pump for removing water from the condenser. The duty heretofore performed by the air pump is thus separated, by which the water pump used for removing the injection water, and the water of condensation from the condenser, may be less than an air pump usually employed for a like sized steam engine wherein the air pump performs the two duties of an air pump and a water pump for removing the air and the water from the condenser; G is the injection cylinder or engine; the water for injection is admitted on one side of the piston, and the air from the condenser is admitted on the other side of the cylinder, and as the injection water which enters the cylinder G through the supply pipe H is subject to the pressure of the atmosphere, it will by pressing on the piston I in the cylinder G aid the working of the steam engine with which it is used; J is the piston rod of the cylinder or engine; G and K is the piston or pump rod of the water pump L. Motion is given to the two piston rods J K by the steam engine with which the cylinders G and K are in combination. In the fig. the parts are shown in the positions they assume when the pistons I and M are descending, and the valve N of the cylinder G has closed the passage for the water into the cylinder G, and opened the passage for the injection water to pass from the cylinder G into the chamber or vessel D, whilst the air from the condenser passes from the condenser through the pipe O into the upper end of the cylinder G.

Fig. 4 shows a vertical section of a condenser, in which corrugated sheet copper or other metal is used, bent or formed into annular vessels one within the other. The steam is admitted at the inlet pipe P, and the water of condensation and the air are removed at Q, cold water enters at R, and passes off at S, after being circulated through the annular vessels, as indicated by the arrows.

STEAM-BOILER EXPLOSIONS.

The following is an abstract of the chief engineer's monthly report, which was presented at the last ordinary monthly meeting of the executive committee of the Association for the Prevention of Steam Boiler Explosions, held September 2:—

"During the past month the ordinary visits of inspection have been made, and 8 boilers tested by hydraulic pressure, the following defects being discovered in the boilers examined:—Fracture, 3 (2 dangerous); corrosion, 26 (6 dangerous); safety-valves out of order, 14; water gauges ditto, 10; pressure gauges ditto, 13; feed apparatus ditto, 4; blow-off cocks ditto, 37 (1 dangerous); fusible plugs ditto, 6; furnaces out of shape, 3; blistered plates, 2. Total, 118 (9 dangerous). Boilers without glass water gauges, 4; without pressure gauges, 16; without blow-off cocks, 11; without back pressure valves, 31.

"The principal cases of dangerous injury which have arisen this month have been due to corrosion, the continued recurrence of which shows the importance of having all boilers examined, not 'externally' only, but also 'internally and thoroughly.'

"Another explosion has occurred during the last month to the class of plain cylindrical egg-ended boilers, fired externally. The boiler in question, which was not under the ins ection of this association, was one of a series of six connected together, in the midst of which it had worked, being the fourth from one end, and the third from the other. Its length was 30ft., its diameter 5ft., the thickness of its plates $\frac{3}{8}$ths of an inch, and its work-

ing pressure 50lbs. The rent, as is usual in these cases, occurred at one of the transverse seams over the fire, but the developement of the line of fracture was somewhat peculiar. In ordinary cases these boilers, on explosion, separate at one of the ring seams into two distinct halves, which fly in opposite directions; but, in the present instance, the first belt of plates was completely severed from the remainder of the boiler and flattened out, having rent through the line of rivets at each of its four edges, while the egg-end had become entirely disengaged from it, and, in addition, was torn into two parts. The remainder of the boiler, which was by far the greater portion, being about 24ft. long, had flown to a distance of from eighty to ninety yards, and the chimney, which was reduced to a heap of ruins, had either been swept down by it in its course, or blown down by the impact of the steam.

"There was no evidence of there having been either deficiency of water or excess of pressure; while each boiler in the series was fitted with two lever safety valves of three inches' diameter, a glass water gauge, and a back-pressure feed valve. The exploded boiler was about four years old, and had been repaired seven months since, at the part immediately over the furnace, by the introduction of two new plates.

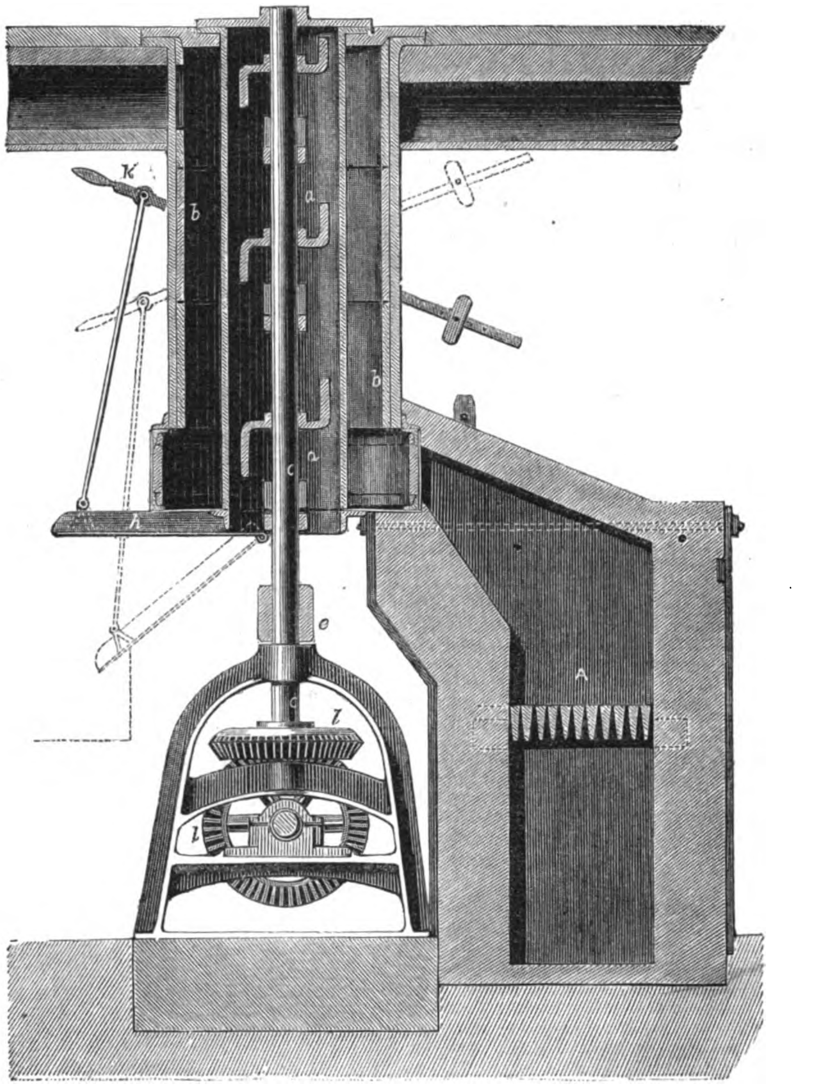
"It will be observed that the above explosion is another instance of the liability of these externally fired boilers to rend at the transverse seams over the fire. The combined duty thrown upon these seams is so great, that there is more uncertainty with these boilers than with those of the internally-fired double-furnace class in ordinary use in Lancashire. All the points in the latter can be so entirely mastered that they may be thoroughly relied on, and if well made, and in sound condition, can, with proper care in working, be guaranteed as safe for a period of twelve months from the time of examination. Not so, however, with the externally-fired boiler, in which the shell has to endure the entire disruptive strain combined with the direct impingement of the flame. In the internally-fired boiler these two duties are divided; the shell, which bears the tensile strain, being guarded from the intense action of the fire, which the furnace tubes are adapted to bear, from their small diameter and facility for strengthening, either by flanged seams, hoops or otherwise; while the deposit, which to a great extent rolls off the furnace crowns, and falls harmlessly to the bottom of the boiler in one case, deposits itself immediately on the fire in the other. Thus the seams of rivets in externally fired boilers have to contend with the combined influence of tensile strain, the direct action of the fire, and too frequently with an accumulation of incrustation tending to overheating; and even where this does not form a positive coat, it may yet suffice so to thicken the water that the steam lifts it from the surface of the plate, when over-heating unavoidably ensues; added to which sudden draughts of cold air, on opening the furnace doors, cool the outer laps of the plate at the seams, which thus become subjected to the constant alternations of expansion and contraction.

"Under these circumstances it is not surprising that the seams of rivets in under-fired boilers should frequently be found suddenly to give way, for which the surest remedy will prove to be the substitution of internally-fired boilers in their place. Where, however, those externally fired are still adopted, it is earnestly recommended, in the first place, that good materials and workmanship should be secured; in the second, that every means should be adopted for the prevention of incrustation; and, in the third, that the seams of rivets should be constantly and narrowly watched, so as to detect the first signs of weakness, which should be immediately repaired.

"Ready examination is facilitated by setting these boilers, as some of our members are doing, with a single direct flash flue, in which are a series of bridges, one behind the other, for keeping the flame in contact with the boiler; an entrance being made beneath the furnace bars, as well as a small archway through the back bridges, to allow of a communication throughout.

"L. E. FLETCHER, Chief Engineer."

WOOD'S IMPROVEMENTS IN THE MANUFACTURE OF ARTIFICAL FUEL.



MR. T. H. WOOD, of Blackweir, Glamorgan, has patented an "Improvement in apparatus employed in the manufacture of artificial fuel."

The invention consists in constructing and arranging a cylinder or tube, and parts connected therewith, in which cylinder dry and hot coal and pitch are finally intimately mixed or amalgamated together during their manufacture into artificial fuel, in such manner that the said cylinder or tube may be maintained from top to bottom at a red heat, and that the material may be passed through the said cylinder, and be thoroughly mixed and amalgamated therein without choking or clogging.

Within an outer casing, lined with fire clay or other material, to prevent loss of heat by radiation, a vertical iron cylinder or tube is placed, leaving a space between the casing and the tube. This space forms a spiral flue communicating at bottom with a furnace, and having its outlet near the top and from the side of the apparatus. Upon a shaft made to rotate inside the cylinder, arms are fixed, the ends of each arm being turned or bent up or down at right angles, or nearly so, with the arm. These bent ends approach nearly to, but do not touch, the cylinder, and act as scrapers to keep the cylinder clean, and prevent it being clogged. The cylinder is fed at top, and the amalgamated material issues from the bottom into a shoot provided for its reception. The discharge of the material is regulated by the inclination of the shoot.

The above engraving is a longitudinal section of an apparatus constructed according to this invention. *a* is a vertical cylinder or tube; and *b* is the outer casing made to form a spiral flue, by which heat is conveyed round the cylinder *a* from a furnace A, opening into the said flue; *c* is a shaft passing through the cylinder, and supported at bottom in a shoe; *e* is a socket joint or coupling to allow of the shaft being removed when not in use, or of its being replaced by another, should circumstances require it. Arms are placed on the shaft with bent-up ends and turn-down ends, as shown. The dry and hot coal and pitch are fed in at the top of the apparatus, and escape from the lower part thereof, through an outlet; *h* is a flap or shoot, the outer end of which is connected by a chain or rod to a lever *k*, with a balance weight, so that the opening can be closed when the machine is first put into operation, and afterwards either partially opened as the state of the material operated upon may require; thus regulating the angle at which the flap is kept, and thereby the discharge of the amalgamated material; *l l* is the driving gear. For the purpose of facilitating the removal of the shaft and scrapers when required, a pulley chain and winch are fitted immediately over the shaft *c*.

A huge battery is in course of construction at Woolwich, to carry a number of 110-pounder Armstrong guns, for the purpose of experiments at sea. The floating battery Trusty, fitted with Capt. Coles's cupola, and destined for experiments with the 300-pounder Armstrong gun, to fire a 150-pounder cylinder, still remains in basin at Woolwich, under a protest of Captain Coles, as not having been fitted in accordance with his design, nor under his supervision,

ERICSSON'S MONITOR OF 1854.

We have received an illustrated circular from New York. It is headed "Ericsson's Monitor of 1854; America, not England, its Birth-place; Ericsson, not Coles, the Inventor of the Revolving Cupola." The circular gives a side elevation of the battery, and a transverse section of the centre of the revolving copula. It also gives an extract from a communication addressed from New York to the Emperor of the French, on Sept. 26, 1854. The receipt of this communication was at once acknowledged by his Majesty. The following are extracts:—

New System of Naval Attack.—The vessel to be composed entirely of iron. The midship section is triangular, with a broad hollow keel, loaded to balance the heavy upper works. The ends of the vessel are moderately sharp. The deck, made of plate iron, is curved both longitudinally and transversely with a spring of 5ft.; it is made to project 8ft. over the rudder and propeller. The entire deck is covered with a lining of sheet iron 3in. thick, with an opening in the centre 16ft. diameter. This opening is covered by a semi-globular turret of plate iron 6in. thick, revolving on a column and pivot by means of steam power and appropriate gear-work. The vessel is propelled by a powerful steam engine and screw propeller. Air for the combustion in the boilers, and for ventilation within the vessel, is supplied by a large self-acting centrifugal blower, the fresh air being drawn in through numerous small holes in the turret. The products of the combustion and impure air from the vessel is forced out through conductors leading to a cluster of small holes in the deck and turret. Surrounding objects are viewed through small holes at appropriate places. Reflecting telescopes, capable of being protruded or withdrawn at pleasure, also afford a distinct view of surrounding objects. The rudder stock passes through a water-tight stuffing box, so as to admit of the helm being worked within the vessel. Shot striking the deck are deflected, whilst shell exploding on it will prove harmless. Shot (of cast iron) striking the globular turret will crumble to pieces, or are deflected. This new system of naval attack will place an entire fleet of sailing ships, during calms and light winds, at the mercy of a single craft. "Boarding," as a means of defence, will be impracticable, since the turret guns, which turn like the spokes in a wheel, commanding every point of the compass at once, may keep off and destroy any number of boats by firing slugs and combustibles.

A fleet at anchor might be fired and put in a sinking condition before enabled to get under way.

Of what avail would be the "steam guard ships" if attacked on the new system? Alas for the "wooden walls" that formerly "ruled the waves!"

The long-range Lancaster gun would scarcely hit the revolving iron turret once in six hours, and then, six chances to one, its shot or shell would be deflected by the varying angles of the face of the impregnable globe. When ultimately struck at right angles the globe, which weighs upwards of forty tons, will be less affected by the shock than a heavy anvil by the blow of a light hammer; consequently, the shot would crumble to pieces, whilst the shell would strew the arched deck with harmless fragments.

During contest the revolving turret should be kept in motion, the port-holes being turned away from the opponent except at the moment of discharge, which, however, should be made during full rotation, as the lateral aim in close quarters requires but little precision.

Absurdity of Captain Coles' Claim.—Captain Coles states, in a letter to the *Times* of April 5, 1862, that his experience in the Baltic and Black Seas, in 1855, suggested to him the idea of building impregnable vessels, and that towards the latter part of the year he had "a rough model made by the carpenter of the Stromboli," and that he proposed to protect the guns by a stationary shield or cupola. Captain Coles, it appears, met with no encouragement from the Admiralty, and therefore consulted Mr. Brunel, the celebrated engineer, who warmly embraced the plan. "He did more," says Captain Coles, in his letter to the *Times*; "he assisted me in my calculations, and gave me the aid of his draughtsmen." Captain Coles further states that, notwithstanding official neglect, he persevered, and in March 1859, produced drawings of a "shield fitted with turn-tables." Lastly, in December 1860, Captain Coles published, in *Blackwood's Magazine*, drawings of his "gun-shield and revolving platform," the platform being turned by manual power only.

AN INDIAN COAL FIELD.

British India is far from being without its coal fields; indeed, we believe we are correct in saying that it possesses a large number, which are rich in this material. The fields of Karharbale, Sylbet, Assan, Palamo, Bandelkand, and Narbadda Valley, produce yearly a large supply of coal; but the largest and most important field is known as the Raniganj, or Burdwan, or Damuda field, which is known to yield the largest supply, and no region in India can compete with the Raniganj coal fields in the quantity obtained from its seams.

This field embraces an area of 500 square miles, and is thirty-nine miles by eighteen in its two greatest diameters. It appears, however, that a considerable proportion of this land is not entirely occupied by coal-beds, as they are restricted to two sub-divisions of the strata which are contained in the field. Those which alone contain coal seams are the Raniganj and Barakar, or Damudas series, which comprise together a thickness of about 7,000 feet of beds. Important and extensive collieries are worked in the Raniganj series, but the mines of the Barakar series are fewer and of less importance. It is said that the coal here, although it exists in enormous quantities, is in quality so variable, and the thickness of the seams so irregular, that mining operations are not carried on to a great extent. But even the profitableness of these extensive mines depend greatly on the extension of the explorations there. A line of railway will, however, do much to carry out this object. It is a singular fact, but worthy of being recorded, that for some time there were great doubts expressed as to the existence of coal in the Raniganj mines, owing to certain unreliable reports made by a committee some years ago. The Geological Surveyor to the East India Company, with great difficulty, endeavoured to dispel the unfavourable opinions; but, since that gentleman's death, coal seams have been worked in the very spot where it was so urgently contended there were none.

The extraordinary mineral properties of the coal fields to which we have alluded have made them very popular in India. They contain animal remains, and, it is said, abound in mollusca of the carboniferous age. In the course of a recent survey, a "bone bed" was found on the banks of the Damuda, which abounded with skeletons of extinct animals, and these discoveries have awakened a great deal of surprise and attention among our scientific brethren in India. By the recent report on the Geological Structure and Relations of the Raniganj Coal Field, we find that they comprise a vast number of valuable fossils of enormous size.

We might add, that so large is the supply of coal found in the Raniganj seams, that the out-turn is only limited by the small number of labourers engaged in the working of them.

WHEATSTONE AND THE UNIVERSAL PRIVATE TELEGRAPH COMPANY *versus* WILDE.

This important patent case, which was partly heard before Mr. Baron Wilde and a special jury, and afterwards referred for arbitration to Mr. Lush, Q.C., after a protracted hearing of twelve days, has at length terminated in favour of the defendant. The plaintiffs' invention, upon which the action was brought, was for an improvement in the transmitting instrument of a magneto-electric dial telegraph, which consisted of a method of keeping the armature of the magneto-electric machine in continuous motion, while finger-keys regulated the passage of the currents into the telegraphic circuit. The defendant, by the peculiar construction of his magneto-electric machine, was enabled to stop the armature every time a finger-key was depressed.

The armature was made to revolve by means of a pulley driven by a band, the tension of which was so regulated that when the mechanism of the transmitting instrument (including the armature) was stopped by the depression of a finger-key, the band slipped upon the pulley, and no more currents were produced; but on releasing the finger-key the motion was immediately taken up, and currents were again generated and allowed to pass into the circuit.

The plaintiffs contended that continuous motion of the motive power was equivalent to a continuous motion of the armature. It was, however, clearly shown that this was not so, for the defendant's armature required to be made very light, so that it might be stopped with facility; while, on the other hand, the plaintiffs' armature being kept in continuous motion, its size and weight were of no consequence.

The arbitrator, therefore, decided that a stopping armature could be no infringement of an armature in continuous motion, and that the bill of complaint in the Court of Chancery should be dismissed, and the costs thereof, and the reference and award should be paid by the plaintiffs.

ELECTRIC ENGRAVING MACHINE.

This machine, shown in Class VII. of the International Exhibition, is used for engraving the cylinders of copper or brass, employed in the printing of woven fabrics and paper hangings.

Its great distinctive feature — apart from its general mechanical arrangements — is in the application of voltaic electricity in communicating certain necessary movements, to important and delicate portions of the apparatus.

The cylinder to be engraved is first coated on its outer surface with a thin film of varnish, sufficiently resistant to the continuous action of the strongest acids. The requisite number of copies of the original design are then traced or scratched simultaneously by a series of diamond points which are arranged on the machine, parallel with the axis of the cylinder. Each diamond point is in correspondence with a small temporary magnet, and the entire series is so arranged *en rapport* with the original design, which had been previously etched on a metal cylinder filled in with a non-conducting substance (this cylinder being made to revolve in contact with a tracing point), that when the electric current passes, intermittent currents are established, whereby the diamonds are withdrawn from their work at the proper intervals. The metallic surface is thereby exposed in certain parts, and a bath of nitric or other acid being afterwards used to etch or deepen the engraved portion, the operation is completed.

Amongst other special advantages said to be derived from the use of this apparatus, the facility with which engravings may be enlarged or diminished to any necessary extent from the same original, is not the least important.

TO CORRESPONDENTS.

Received:—G. F. P., W. R., North Moor Foundry Company, J. B., W. N. P., W. H. (we cannot correct all the errors of the *Times*), C. B. K., J. N., H. W., R. T., Admiral H., W. W., J. R. D., D. T., J. J., S. A. M.

Correspondence.

[We do not hold ourselves responsible for the statements of our Correspondents.]

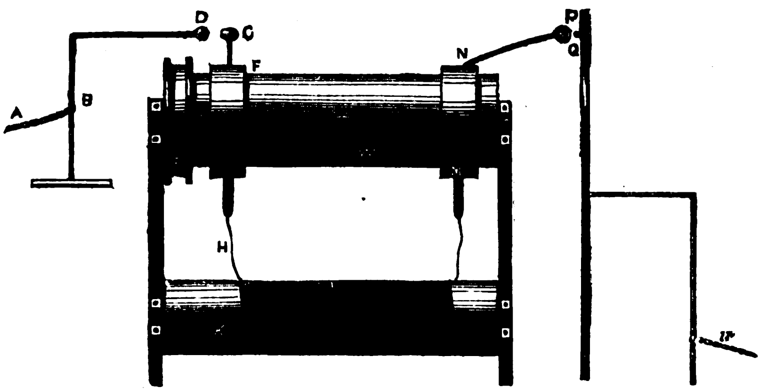
THE STRAIGHT LINE *VERSUS* THE WAVE LINE FOR VESSELS.

TO THE EDITOR OF "THE MECHANICS' MAGAZINE."

Sir,—In my letter to you on this subject, contained in the Mechanics' Magazine of the 22nd ult., I remarked that Mr. Cheverton seemed to me to turn his attention more to the water after it had been disturbed by the passage of the vessel than to the question at issue, viz. how to move the water so that the least power shall be expended in moving it. I see by his reply that he does not do so.

Referring to his letter in your journal of the 15th ult., I find his remarks to be as follow:—"In the passage of a vessel through the water there is an immense amount of motion among its particles, which, though occasioned thereby, is not due immediately to the propulsive action of the bow, and which does not enter as an element into the resistance encountered. The proximate causes thereof are the head of water raised in front and the depression produced at the stern. These give rise to currents and waves, the latter being propagated indefinitely."

In his reply to my letter, in which I spoke of the snow and ice accumulating against the piles in the



form of a wave-line cutwater, he says: "The destructive tendency of the current is to remove obstacles at any cost of power; nature is not called upon to economise; and so the ice, supposed to have at first a triangular shape (straight line bow?), is gradually destroyed just below the apex of the cutwater, where it is weak (where the resistance increases?), until it takes for that portion of it the form of least resistance corresponding to its own strength, and the velocity of the stream (wave line bow?), that is to say, it becomes a more acute triangle with sides not differing sensibly for some little distance from straight lines; but observe that this can take place (assuming the breadth of the cutwater is maintained) only with the necessary consequence of a more obtuse form being produced at a point farther down the stream (greatest breadth of ship?), and offering a greater resistance than the straight line would have done. As this result is gradual, a hollow curve line is generated with the salient angle at the haunch rubbed off."

I will accept this explanation of Mr. Cheverton's as a proof of the wave or hollow line, when properly applied, being superior to any other form for least resistance. I will take the current to represent the speed of the ship through the water; the power "to remove obstacles," as the wind or steam propelling that ship; and the "more obtuse form farther down the stream offering a greater resistance," as the beam of the ship or greatest immersed section of resistance, to be forced through the resisting fluid; and what more can be wanted by way of proof that we have the form of least resistance? As to his remarks on "variable velocities," "mean resistance," &c., and his regarding what has been advanced on behalf of the wave line to prove its superiority "as proof to just the contrary," I have nothing to say; one is free to believe or disbelieve as one chooses, or, more possibly, c cording to the limit of one's understanding; but what is required here is proof, not supposition; facts, not theory; the results of practical working, not deductions from theoretical notions of what should or should not be. The problem is that of moving a given resistance, or immersed section of hull, at a given velocity, with the least expenditure of power, and, consequently, with no more disturbance of the water in which it floats (or, in plain English, by causing no more water to move out of the way) than is required for the passage of the widest portion of the ship, and the question is, what form of line for the bow of the ship is best; is it the wave line, the convex line, or the straight line? I answer that practice proves the wave line to be the best, and what Mr. Cheverton must now do is to prove, from the results of practice, that the straight line is superior, or even equal.

Mr. Cheverton does not say whether he has read the works I named; I do not think he has, or he would certainly not advance the idea that there is any similarity between a fish totally submerged, and moving in a "homogeneous" element, and a ship floating on that element, exposed to other and external influence. "I take it that this is only an example of a wrong interpretation of phenomena," or, at least, of choosing as an illustration a case anything but applicable to the purpose.

I shall now, with Mr. Moy, "remain silent upon the subject" until Mr. Cheverton can bring forward proofs, and "something better than he has hitherto done," of the superiority of his straight-line bow for ships.

Apologising for again troubling you on the subject,

I am, sir, your obedient servant,

CHAS. F. T. YOUNG, C.E.

7 Duke St., Adelphi: London, Sept. 1, 1862.

NEW METHOD OF ASCERTAINING THE VELOCITY OF ELECTRICITY.

SIR,—The above is a nice subject of philosophical enquiry. I am not aware that what is called the velocity of electrical transmission has been satisfactorily determined. From a great many experiments which I have made, but which it would take too much of your space to detail here, I am inclined to believe that electrical transmission is instantaneous. In thinking upon this subject for some years, the following scheme occurred to me lately, by which, so far as I can see, the velocity of glass electricity may be determined, if anything less than 1,000,000, or any less number of miles per second, or any greater number of miles per second, by enlarging the extent and the expense of the apparatus. If it be true (as it appears to be, according to Faraday's experiments) that glass and voltaic electricity are the same (although it is with the greatest deference, from innumerable experiments I have made, I beg to dissent) than the velocity determined in respect of glass, electricity will apply in ordinary railway transmission. The above sketch will enable any intelligent person acquainted with the mere elements of electricity to understand what I mean.

Let B be a metallic stand connected with what is called the positive part of an electrical apparatus by means of the chain or other metallic communication A. C is a stud, terminated by the ball D; W is a cylinder of baked wood or any other non-conducting material, which can be put into any attainable rate of rotatory motion, by means of a belt circling the pulley E. The hoop F is affixed to the cylinder W, to which is attached the stud terminating in the knob G. A spring is supposed to press on the hoop F in electrical communication with an insulated wire H, wound round K, which wire may be of any length—the longer the better. The end M of this wire presses, by means of a spring, on the other hoop round W. To this hoop is attached a rod N, and a knob P, the knobs G and P being in the same straight line parallel to the axis of the cylinder W; so that when the knob is at the least striking distance from D, the knob P may be at the zero point Q on the circular disc. This disc is supposed to be graduated from the zero point at Q up to any number of equal parts—say a thousand—and fixed. It communicates with the negative part of the apparatus by means of a chain W, from the disc. Hence, when G is at the least striking distance, the electrical communications proceed from D G, thence along the wire round W, through the hoop to the disc opposite P, and from that, by means of the chain or wire W, to the negative part of the apparatus. Now, if the communication from D to Q is instantaneous, the spark or mark at Q will take place at the zero point of the disc. But suppose that the cylinder W makes 100 revolutions in a second, that the wire round K is 100 miles long, then, in the 100,000th part of a second, Q passes from the zero point of the disc to the division 1 on the same; in double the time to 2; and so on. These divisions may be determined by pasting paper soaked in a mixed solution of starch and iodide of potassium on the disc. Then, if any measurable interval is occupied in this transmission, the same is the time taken to pass through the wire round K; and thence the velocity of transmission may be determined.

A. ROY,

Government Examiner in Navigation,

Local Marine Board, Dundee.

August 21, 1862.

PROPOSED BRIDGE ACROSS THE HOOGHLY.

SIR,—I observe in your Magazine of last week that in an account of a proposed bridge over the Hooghly, near Calcutta, the span of the Niagara Suspension Bridge is stated as 281ft. This is probably a misprint. It is well known that the Niagara bridge has a clear span of 822ft., which is, I believe, at present the longest span for railway traffic yet constructed.

It should be noted, however, that the speed of all trains is restricted by special rule to five miles per hour in crossing, and it is doubtful whether the timber truss below the suspension chains would prevent for any length of time the occurrence of dangerous undulations during the rapid passage of heavy trains. I believe, from personal observation of the structure, that the fastenings would shake loose; but, at the same time, am inclined to think that at no distant date the suspension principle, with rigid chains and platforms, will be almost universally adopted for all large railway bridges. Various methods of stiffening such spans have been proposed, and the enquiry is one to which a greater degree of attention may be profitably directed than has hitherto been accorded to it.

I remain, your obedient servant,

A. ALEXANDER.

13 Gresham Street, London, E.C.: Sept. 8

MR. S. W. WORSSAM AND "THE ENGINEER."

SIR,—I beg to intrude upon your valuable columns, and trust through them you will grant me the opportunity of refuting the following assertion published by the editor of the *Engineer*, in his remarks upon a letter of mine inserted in that journal of the 5th inst., viz.:—"Mr. Worssam has written several letters on this subject which were of a tone altogether precluding their admission into our columns." This I emphatically deny. I have written but two letters, both of which have been inserted in that journal, one on Aug. 22, the other was sent by me on the 29th, but not inserted till the following week (the 5th inst.), the first paragraph only having been altered to suit the whim of the editor. Underneath is the original (being of a tone precluding it from the columns of the *Engineer*) for your perusal; the insertion of the paragraph so substituted will assure my friends I have written nothing so invidious as the editor would have them infer:—

"You are pleased to be facetious in your remarks upon my former letter. I should imagine you had crossed the Atlantic and caught the mania for perversion. You accuse me of assuming that in the article in question, you wrote from assumption rather than fact."

Yours, most respectfully,

S. W. WORSSAM.

Sept. 9, 1862.

Gossip.

Upwards of 300 tons of the forged $4\frac{1}{2}$in. armour-plates for casing the sides of the iron-clad frigate Royal Oak, 50, have been received at Chatham during the past few weeks from the Thames Iron Works, the Parkgate Foundry, and the other firms under contract to supply the Admiralty. The whole of these have been tested under the direction of the leading officials of the establishment, and each submitted to the annealing process in the factory erected for that purpose, in order to render the iron as tough as it is possible to make it. Although the operation of plating the Royal Oak has been suspended for the last fortnight, to enable the necessary arrangements to be made for her launch, the preparation of the plates is still carried on in the factory, where upwards of one hundred of the large slabs are now accumulated. Each plate before being affixed to the frigate's side costs, on the lowest estimate, 200*l.*, the contract price, at which they are supplied to the Admiralty, being 37*l.* per ton. The plates average a weight of 80cwt. each, which will give an original cost of 148*l.*, added to which there are the charges for annealing, bending, planing, boring, and otherwise preparing them, to accomplish which the most costly machinery has to be employed.

The *Cumberland Pacquet* informs us that during the week Mr. John Kennedy has been giving tests to the new screw which he has invented for the propulsion of vessels. The testings were made with an open boat, to which Mr. Kennedy had attached one of his screws, and he has had the gratification of finding that the screw possesses propelling and backing powers of great extent.

An invention of a novel nature has just been laid before the Board of Admiralty, which consists in two distinct and separate gunboats strongly united together, but having two separate bows and sterns, as well as keels. This novel description of ship is propelled by two screws, in addition to two of Gladstone's chain-paddles, on each side. The inventor states that such ships are perfectly manageable, and that a speed of twenty-four knots an hour will be attained by them! Among other advantages claimed by the inventor is the fact that they will be able to make better headway in rough weather, and that, should the engines of one be out of order, the other will be able to do the work of both, *pro tem.* The natives of the Sandwich Islands formerly used similar "twin sailing vessels." And it will be remembered by our readers that we inserted a letter from Captain Selwyn on the subject.

At the weekly meeting of the Mersey Docks and Harbour Board, last week, Mr. Lyster, the dock engineer, having taken into consideration the application of Messrs. Gibson & Kinder for extensive accommodation for the storage and manufacture of petroleum at Birkenhead, had prepared a most complete report on the subject, as well as plans of the proposed buildings which he suggested should be erected to the westward of the graving docks at Birkenhead. This report had not yet been fully considered by the works committee, but it had been sent out to several firms interested in the petroleum trade, with the view of ascertaining their opinion of the scheme. A letter in reply, the only one yet received, was read from Mr. A. S. Macrae, speaking in the highest terms of the engineer's plan as one which was calculated to work most satisfactorily both for the trade and the public. Mr. Lyster's plan will probably be fully considered at the next meeting of the works committee, and, it is believed, will afford the most complete accommodation for carrying on the trade upon a very extensive scale, and the cost of the works he estimates at about 37,830*l.* The Town Council have unanimously approved of this plan.

On Friday last, Mr. Glashier made another ascent from the yard of the gas-works at Wolverhampton, in Mr. Coxwell's balloon, for meteorological experiments, which are being conducted under the direction of the balloon committee of the British Association for the Promotion of Science. At twelve o'clock 60,000 cubic feet of gas, of a rarity that exceeded any that Mr. Proud, the skilful engineer to the gas company, had produced previously, having been pumped into the balloon, Mr. Glashier entered it with an array of meteorological-testing instruments of wondrous delicacy, and Mr. Coxwell having taken up his position, the aerial ship was loosed from her moorings, and floated away in the direction of Stourbridge.

Mr. John White, of West Cowes, has received orders to build a paddle-wheel steamer to realise a speed of eighteen miles an hour.

It is proposed to form a line of railway from Seabrook, in the vicinity of Hythe, Sandgate, and Shorncliffe camp, to the Beakesbourne station on the London, Chatham, and Dover Railway.

The Scotch pig-iron market during the past week has been less active, and the speculative demand, which was very eager during the month of August, has greatly diminished. A fortnight ago, the price was 56*s.* 9*d.*, and on the 5th of this month 55*s.* 6*d.* cash, with the appearance of soon touching somewhat lower figures. The shipping demand is rather sluggish, but home consumption is improving. Bar iron makers have seldom been busier than they are just now. Founders have also got better orders, and the trade, on the whole, is said to be in a more satisfactory state than it has been for many months. Exports last week were 12,255 tons, against 10,526 tons same week last year.

Mr. James Bruce, in a communication to us, says: "I find that among the numerous substitutes offered for cotton, none produces for colour, length, and fineness of fibre anything to equal the *Lichen plicatus* (or Hairy Tree). It is only necessary to dry it in an oven, to thresh it, and to sift it to obtain the fibre."

The third Conversazione of the Society of Arts will take place at the South Kensington Museum on the 8th of October.

The Emperor of the French went on Monday week to the Polygon of Vincennes to witness some experiments with the system of cartridges with compressed powder. A new invention called the "pendulum cannon," a new infantry musket, and a new system of breech-loading gun, invented by M. Chassepot, were tried before His Majesty, who appeared very much satisfied with the results.

"An Artizan" writes: "Palmam qui meruit ferat." The differential pulley-block (though by no means a new invention), being but little known, merited a description in your pages. It was the invention of, and the credit for its ingenuity belongs, however, to, a "Mr. Moore, of Bristol," and by his name, if any, should it therefore be called. It is fully described in Dr. Carpenter's "Mechanical Philosophy," London, 1843, pp. 282–3, and the author expresses his surprise "that this ingenious invention has not come into more general use."

A Munich letter states that the telegraphic cable made at Cologne for the purpose of communication between Landau and Bohrschäch across the Lake of Constance is quite finished, and will soon be submerged. It is 70,000ft. in length, and contains four wires.

A novel incident, says the Philadelphia *Ledger*, occurred on the Widow M'Clintock's Farm, Oil Creek, recently. That portion of the tubing of the Van Slyke well which runs into the receiving tanks from the well was removed, in order to make some repairs, leaving the conductor-pipe still in the well. Next morning the inhabitants of that region were startled by the sound of a gigantic steam whistle, and found that it proceeded from this well. The gas, forcing up through the pipe, had probably met with some obstruction, which caused it to perform in this way. The scream of this whistle was tremendous, and could be heard several miles.

The Portpatrick Railway, which is only 7½ miles right across the peninsula, has cost about 90,000*l.* The principal piece of masonwork is a viaduct of 14 arches, and from 90 to 100ft. high, crossing the Piltanton Burn, at a short distance from Colfin station. This station, which lies about half-way on the new railway, is the apex of the line, the road being from Stranraer up-hill, and from Colfin all down-hill. For half-a-mile below this place the incline is 1 in 240; then there is, for a short space, an incline of 1 in 64; and from Pinminnock down to Portpatrick it is 1 in 57; and on the beach thence down to the harbour, as steep as 1 in 35. There are also some heavy cuttings on the new line, the greatest of which is that half-a-mile above Portpatrick. This cutting is nearly three quarters of a mile in length, and is through the solid rock, every foot of which had to be blasted. The other heavy cutting, and consequently the second most expensive part of the line, is a cutting not far from the viaduct alluded to.

A letter from Copenhagen informs us that the American Company for the construction of the great canal between the Baltic and the German Ocean, is so far advanced in its operations as to have completed the survey of the ground, and fixed upon the direction of the works. In accordance with this latest project, which, it will be remembered, is the sequel of many preceding attempts, the canal would start from Brockdorf, on the Elbe, and, passing through the Warden and Taschen lakes, reach the Baltic at a village called Haffkrug. The canal is intended to be 60 miles in length, 180ft. wide, having a depth of 24ft. at least. To secure its connection with the railway system, an inland harbour is to be constructed at Elmshorn, while branches will be made to the important towns of Eutin and Plon, thus bringing Lubeck within a short distance of the new water communication.

The proposal for a new line of railway is being urged by the influential inhabitants of the districts of Aberfeldy, Grandtully, and Kenmore. This line would bring these districts within four hours' communication of the cities of Edinburgh and Glasgow, will be of much importance to the landed proprietors and farmers of the country it traverses, and bring a great increase of traffic to the Crieff Railway.

During a recent storm in Iron Mountain, America, the lightning struck a large ore bank in one of the furnace cuts, and dislodged and threw down from 2,000 to 2,500 tons of ore. To have dislodged the same by powder would have cost the company several hundred dollars.

On Friday evening two gasometers were destroyed at Liverpool. It appears that for some weeks past the contractors for the Garston Junction Railway have been levelling some land in Mersey View Street which had a slight declivity. This land abuts on the wall surrounding the two gasometers, or the south portion of the works, and in filling up the land some hundreds of tons of rubbish were laid against this wall. On the evening in question the entire wall gave way, totally destroying the two gasometers. Upwards of 300,000 cubic feet of gas escaped. One of the gasometers is one of the finest in the kingdom, being upwards of 125ft. in diameter. The estimated cost of the loss of gas is about 200*l.*, and the damage to the two gasometers will exceed 1,000*l.*

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

The Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the proprietors of this Magazine. Other papers are hereby warned not to produce them without acknowledgement:—

Steam Engines, &c., 478, 483, 491, 503, 522.

Boilers and their Furnaces, &c., *None.*

Roads and Vehicles, including railway plant and carriages, saddlery and harness, &c., 461, 465, 474, 498, 513.

Ships and Boats, including their fittings, 452, 493, 501, 517, 530.

Cultivation of the Soil, including agricultural and horticultural implements and machines, 457, 496, 511.

Food and Beverages, including apparatus for preparing food for men and animals, 471, 490, 502, 512, 525, 531.

Fibrous Fabrics, including machinery for treating fibres, pulp, paper, &c., 453, 462, 463, 472, 476, 477, 487, 492, 506, 515.

Buildings and Building Materials, including sewers, drain-pipes, brick and tile machines, &c., 482, 524.

Lighting, Heating, and Ventilating, 484, 485, 495, 499, 535.

Furniture and Apparel, including household utensils, time-keepers, jewellery, musical instruments, &c., 460, 469, 470, 480, 481, 486, 489, 500, 509, 526, 527, 528, 534.

Metals, including apparatus for their manufacture, 451.

Chemistry and Photography, &c., 504.

Electrical Apparatus, &c., 458, 468, 514.

Warfare, &c., 454, 488, 507, 510, 529.

Letter-Press Printing, &c., 494.

Miscellaneous, 455, 456, 459, 464, 466, 467, 473, 475, 479, 497, 505, 508, 516, 518, 519, 520, 521, 523.

451. E. M. Stochr. *Improvements in the manufacture of manganese, and in the combinations of manganese with other metals.* (A communication.) Dated Feb. 20, 1862.

Here the manganese ore is pulverised and reduced into pulverised charcoal, or other carbonaceous substance, in a crucible; the necessity of producing soluble salts of protoxide of manganese, and the dissolving of the ore by acids, as was heretofore requisite, is thus obviated. The manganese metal produced is hard, tough, and does not oxidise by exposure to the air. Manganese, when manufactured as above described, may be used for many practical purposes. The second part of this invention consists in combining manganese with copper, zinc, tin, nickel, iron, steel, and other metals or alloys of metals, in order to produce metallic compounds for various manufacturing and metallurgic purposes. These compounds are produced by melting the manganese together with the metal or metals in crucibles, the proportions depending upon the particular purpose for which the metallic compound is required. *Patent abandoned.*

452. D. Wilkie. *A ship's compass, which is not to be affected by local attraction or deviation, to be used by sailing vessel or steamer.* Dated Feb. 20, 1862.

Provisional protection has not been granted for this invention.

453. J. Bleasdale and G. W. Borland. *Improvements in fluted rollers for preparing and spinning fibrous materials, and in the mode of manufacturing the same.* Dated Feb. 20, 1862.

This consists in subjecting soft wrought-iron fluted rollers to the process known as "case hardening," whereby these surfaces are made hard or changed into steel, or partly formed steel; and thus, while the rollers have the toughness of soft wrought iron, their surfaces have a greatly increased quality of resisting wear and injury, and they become stronger and less liable to be bent. *Patent abandoned.*

454. R. T. Pritchett. *Improvements in targets or butts.* Dated Feb. 20, 1862.

This invention refers to such targets or butts as are used for leaden projectiles, and consists in facing them with lead, in order that the projectiles may become fixed thereto or therein, and the loss of the lead of which the projectiles are formed may be thereby prevented. In some cases the inventor dispenses with a backing, and fits blocks, plates, or pieces of lead in frames. *Patent abandoned.*

455. J. Paterson. *Improvements in the use of animal charcoal.* (A communication.) Dated Feb. 20, 1862.

Here the charcoal is fed on to revolving discs with projecting surfaces, adapted in their rotation to throw off and distribute such matter equally in the filtering vessels. A fan, or other suitable blowing or exhausting means, is also employed to draw or blow away the finer particles or dust as it leaves the distributing means. *Patent completed.*

456. J. Paterson. *Improvements in means or apparatus for facilitating the evaporation of saccharine resolutions.* (A communication.) Dated Feb. 20, 1862.

Here the patentee forms the pans with their sides gradually inclining outwards, in order to give an extended surface to the fluid, and facilitate the escape of the vapour. Within such vessels he applies revolving discs, travelling belts, &c., supported so that some part thereof may be constantly in the solution under operation. He also applies to such pans, and immersed in the fluid contained therein, propellers or stirrers, suitably arranged. *Patent completed.*

457. C. Wood. *Improvements in horse-rakes.* Dated Feb. 20, 1862.

Here the person that is using the rake is mounted on a seat or platform, which is so placed as to act by its weight, and the weight of the attendant, as a counter-balance to the teeth of the rake when they are being raised to deliver their load of

collected material, as well as for a counter-balance for the weight of the shafts. By a suitable arrangement of a lever or levers, which are acted upon by preference by the feet or foot of the attendant, the teeth are raised as required. *Patent completed.*

458. L. A. S. CHURCHILL. *Improvements in electric telegraphs.* Dated Feb. 20, 1862.

Here the inventor employs two wires to produce a single sign on the indicating instrument—one to carry the outgoing and the other the incoming current. These wires are caused to take different routes, so that the distance between the outgoing and incoming wire may be considerable, and the wires are uninsulated, by which he means the contacts between each wire and the earth, or places where the current may pass from the wire to the earth, are so numerous or extensive as to render the wire unsuitable for telegraphing in the usual manner, where the return of the current takes place through the earth. *Patent abandoned.*

459. J. SPENCE. *Improved apparatus for transhipping and discharging grain and other substances, and for weighing, screening, and fanning such grain and substances during such transhipment and discharge.* (Partly a communication.) Dated Feb. 21, 1862.

This consists of a suitable vessel provided with a screw or other propeller, actuated by steam or other motive power engine, for the purpose of moving the vessel about in a river or dock. The engine the patentee so arranges that it can be disconnected from the propeller of the vessel, and applied to work a set of elevator buckets attached to endless bands or chains, working over pulleys mounted in a suitable framework, which is capable of being placed vertically, or at any required angle, and which he so mounts that it may be elevated or lowered down the required distance to enable the lower end thereof to be introduced through a hatchway into the hole of the vessel to be discharged. The upper end of the elevator frame he supports upon a suitable framework or tower built on the centre of the vessel, and he fits it to slide rods, or between cheek plates, to admit of the elevator being raised or lowered the required distance. *Patent completed.*

460. R. H. SKELLERN. *An improved self-inking hand-stamp or press.* Dated Feb. 21, 1862.

This invention comprises various improvements (the details of which we cannot here give space to) in that class of hand-stamp or press consisting of two side frames mounted together at or near the top by a cross piece, through which slides vertically a hollow plunger, which is raised by a spiral spring in the interior. *Patent completed.*

461. H. WARD. *An improvement or improvements in ladies' saddles.* Dated Feb. 21, 1862.

The patentee claims making the third or leaping crutch of ladies' saddles movable, without detaching it from the saddle, so that it may be adjusted and fixed to suit the convenience of the rider. *Patent completed.*

462. J. STANDISH and J. GOODEN. *Improvements in machinery or apparatus for stripping or cleaning the flats of carding-engines.* Dated Feb. 21, 1862.

Here the inventors cause each flat to be jointed or hinged upon a pin or centre, so that it can be shifted from its original position to one nearly at right angles to it, and at each side of the card cylinder they use a lever, working loose upon the shaft, and give the levers a traversing motion by cams, levers, or other suitable means. The ends of the levers near the flats have holes or bearings for holding a brush or card, which has a revolving or oscillating motion imparted to it, and the levers are provided with pins or projections for turning up the flats upon their centres. As each flat is turned up by the aforesaid levers, the brush comes in contact with the card on the flat, and efficiently strips and cleans it, and, after all the flats have been stripped and cleaned, the levers are returned to their original position for the purpose of repeating the operation, which is performed continuously with the working of the engine. *Patent abandoned.*

463. W. HAMER. *Improvements in apparatus employed in the preparation of cotton and other fibrous materials.* Dated Feb. 21, 1862.

This relates to the removal of the sliver from the can or coiler, and consists in placing underneath the material a spring of metal, so that, as the sliver is removed from the top of the can or coiler, its lower portion is raised upwards by the spring, and thereby prevents breakage. *Patent completed.*

464. E. S. CREASE. *Improved machinery for drilling, boring, or excavating rock or earthy substances.* Dated Feb. 21, 1862.

Here, instead of striking the drill or boring tool with a hammer, the patentee effects the same by means of a cylinder and piston, with a suitable hammer-head attached to the piston rod to strike the head of the boring tool, which is held in suitable guides. *Patent completed.*

465. R. and W. E. PICKIN. *Improvements in the manufacture of carriage bodies.* Dated Feb. 21, 1862.

Here the patentees make a framework of bars or rods of iron, to which framework they connect other rods or wires laid in pairs or otherwise, so as to produce what may be called a skeleton body. Over or under these rods or wires they attach plain or corrugated woven wire network, which, in some cases, they solder to the rods or wires, where they come in contact to obtain increased strength. *Patent completed.*

466. J. KRASUSKI. *An improved apparatus for controlling fiery horses.* Dated Feb. 21, 1862.

This consists of a small hand winch at the disposition of the driver, placed near the seat, or under the saddle for equestrians. A chain, cord, or strap is wound round this hand winch, which is attached to the fore or hind legs of the horse above hocks by a ligature. If the horse become restive, by turning the winch the cord is tightened, which prevents him spreading his legs. *Patent abandoned.*

467. W. M'ADAM and W. CHRYSTAL. *Improvements in sheaves or pulleys, journals, bushes, and other similar bearing or rubbing surfaces.* Dated Feb. 21, 1862.

The patentees claim the application and use of vitrified ironstone ware, earthenware, china, porcelain, and glass, and in the manufacture of sheaves or pulleys, journals, bushes, bearings, castors, and other generally similar bearing or rubbing surfaces, as described. *Patent completed.*

468. S. SMITH. *Improvements in electro-magnetic engines for obtaining and applying motive power.* Dated Feb. 21, 1862.

This consists in a novel mode of arranging, disposing, mounting, and working soft iron cores or magnets, and other moving parts of electro-magnetic engines, so that, whilst each piece of soft iron shall be attracted or drawn towards and through the hollow central passage way or chamber of a helical magnetic coil, or series of such helical magnetic coils, in turn, a direct action in a straight line through such coils is converted into a continuous rotary motion when the helices are connected with the battery, and a current of electricity is caused to circulate through the properly insulated wires forming the coils, and the action may be regulated by any of the well-known means for making and breaking contact. *Patent abandoned.*

469. H. CHAVASSE, T. MORRIS, and G. B. HAINES. *An improvement or improvements in the manufacture and ornamentation of metallic bedsteads, part of which is also applicable to other articles.* Dated Feb. 22, 1862.

The patentees claim: 1, the preparing and coating iron with tin or lead, or both combined, and afterwards electro-depositing upon the same brass, bronze, German silver metal, or other metallic alloy, and manufacturing such iron, either before or after it is so prepared, into bedsteads, curtain-rods, cornice-poles, balusters, and other articles of metallic furniture. 2, using zinc either upon, or as a substitute for iron, and producing thereon a surface in the manner described for the reception of the electro-deposition of brass, bronze, German silver metal, or other metallic alloy. Lastly, the application of stamped, spun, or drawn zinc, or sheet-tinned ornaments, to increase the size and beauty of the articles intended to be manufactured, and the electro-deposition thereon of brass, bronze, German silver metal, or other metallic alloy. *Patent completed.*

470. W. ASHTON. *Certain improvements in machinery or apparatus employed in the manufacture of braids and similar articles.* Dated Feb. 22, 1862.

This consists in the novel employment and use of a long tubular brush or bearing to support the carriers extending from the bolster plate upwards to any length required, whereby the patentee is enabled to lower the bolster plate, and, consequently, to increase the length of the braiding spindle. The use of the long steadying tube also allows of an increase of the speed of the machine, and considerable smoothness in the action thereof. *Patent completed.*

471. W. H. ROSS. *Improvements in the manufacture of sugar.* (A communication.) Dated Feb. 22, 1862.

This consists principally in using, in the manufacturing or refining of sugar, the phosphates of ammonia in conjunction with sulphurous acid, either gas or liquid, or with any of the sulphates or bisulphates. *Patent completed.*

472. J. KIRKWOOD. *Improvements in looms for weaving.* Dated Feb. 22, 1862.

This comprises various improvements in looms, the object being to admit of the application of steam or other mechanical power, and in one modification of loom embodying them are combined with jacquard pattern mechanism of the single lift class. *Patent completed.*

473. A. BORNEMANN. *Improvements in the mode of constructing fountains.* Dated Feb. 22, 1862.

This relates to fountains adapted not only for pleasure grounds, but for drawing-rooms, conservatories, &c., and consists in constructing such fountains so as to work by atmospheric pressure, without the aid of clockwork or other mechanism for producing and maintaining the requisite pressure. *Patent completed.*

474. J. MILLINGTON. *A new or improved hearse or bier.* Dated Feb. 22, 1862.

This invention is not described apart from the drawings. *Patent completed.*

475. G. T. BOUSFIELD. *Improvements in apparatus for elevating hay, straw, and earth.* (A communication.) Dated Feb. 22, 1862.

This invention is not described apart from the drawings. *Patent completed.*

476. C. H. J. W. M. LIEBMANN. *Improvements in felted fabrics suitable for carpets and other similar purposes, and the apparatus employed therein.* Dated Feb. 22, 1862.

This consists in the application of a woven fabric to a felted fabric as a back to strengthen the felt, which may be of any fibrous substance or material capable of being felted. Also in the means of producing a ribbed, chequered, or other figured surface on felted fabrics, which is effected by the use of a woven fabric made of materials or substances not capable of being felted. *Patent completed.*

477. J. TOWNEND. *Improvements in jacquard engines.* Dated Feb. 22, 1862.

This consists in the use of two grip levers hinged at one end to a stud on which they are capable of vibrating or oscillating, and arranged so that the other ends are guided by a vertical slide frame, so that the upright wires can be lifted and lowered vertically, and thereby avoid or dispense with long or oval eyes in the needles. *Patent abandoned.*

478. J. P. D. CAMP. *Improvements in the arrangement of valves for steam and other engines, and in the means of operating the same.* (A communication.) Dated Feb. 22, 1862.

This invention is not described apart from the drawings. *Patent completed.*

479. D. B. WHITE. *Improvements in apparatuses for protecting liquids from the atmosphere while remaining in and during their discharge from the vessels containing the same.* Dated Feb. 22, 1862.

This invention consists in protecting liquids from contact with the atmosphere prior to and during their discharge from the vessels containing the same, such vessels being so arranged with the aid of impervious pistons and liquid luting, or solid packing, or of oil, as to allow of the storing or drawing off of such liquids without atmospheric air coming in contact with them. *Patent completed.*

480. G. BLAKEY, S. BLAKEY, & J. BLAKEY, and R. WHITE. *Improvements in leggings or gaiters.* Dated Feb. 22, 1862.

To construct a legging or gaiter according to this invention, the patentees take a piece of leather, or any other suitable material, and cut it to the required form; so that when the two vertical or longitudinal edges are sewed or otherwise attached together, the required shape is obtained; and in most cases they prefer that the lower part of the front of the legging or gaiter be cut out so as to form an arch over the instep of the foot, and, if required, a gaiter front may be added to cover the top or part of the top of the foot. For ladies' and children's wear, they insert an elastic gusset in the front or back, or both, or one on each side of the bottom of the gaiter or legging. *Patent completed.*

481. G. J. ORAMS. *A revolving pendant for giving greater security to watches and lockets against theft.* Dated Feb. 22, 1862.

Here the inventor attaches the watch or locket to the bow and pendant by a metal tube or solid wire (he prefers a tube) passing through the pendant and case, and forming an axis upon which the pendant or the watch or locket revolves. The security consists in the pendant, from the fact of its revolving, offering no resistance to, but turning, with a sudden wrench. *Patent abandoned.*

482. R. FOSTER. *Improvements in the construction of buildings or erections to be used for horticultural or other purposes.* Dated Feb. 22, 1862.

This consists in a method of so joining or attaching the several parts which compose them that they may be readily taken in pieces when the owner or tenant of them leaves the premises upon which they are erected, the said several parts so composing such buildings being also readily connected together and erected at or on any other convenient place or places. *Patent completed.*

483. W. B. JOHNSON. *Improvements in steam-engines.* Dated Feb. 22, 1862.

This relates particularly to those engines commonly called "horizontal," but are also applicable to those of other constructions, and consists: 1, in placing the air pump at an angle to the cylinder, and in working it by direct action from the piston-rod or cross head; 2, in a peculiar arrangement of air pump foot and delivery valves. The air pump employed is of the plunger construction, and the plunger is caused to pass beyond the end of the barrel thereof. The foot valve is placed at one end, and, when open, its lid or moving part occupies a space which the plunger has left. The delivery valve is at right angles to the foot valve, and is opposite a space which the plunger occupies when at one end of its stroke. In the plunger the patentee places a valve which opens for the escape of air. In constructing foot and delivery valves, he uses india rubber, so that it is confined laterally between metal surfaces; thus he forms a groove, within which the india rubber is placed; or he causes it to abut against a flange. Another part of the invention consists in placing the condenser and hot well beneath the cylinder; another portion relates to a method of providing for adjustment of the piston rod in reference to the guide blocks. For this purpose he forms the said blocks with a square, which may be altered as required by filling pieces. *Patent completed.*

484. M. A. F. MENNONS. *Improvements in burners for heating by gas.* (A communication.) Dated Feb. 22, 1862.

This invention is not described apart from the drawings. *Patent completed.*

485. W. JOHNSTON. *Improvements in gas and other lamps and stoves.* Dated Feb. 24, 1862.

This invention is not described apart from the drawings. *Patent completed.*

486. G. WEST. *Improvements in the construction of washing machines.* Dated Feb. 24, 1862.

This consists of a box or vessel lined on each side about half way up with vertical ribs of wood, rounded at the front. A short distance above the bottom of the box is a grating composed of similar ribs of wood, forming a false bottom, through which the dirt passes and settles in the space beneath, whence it can be easily washed out; the water is drawn off by a tap placed in one end of the vessel. A frame is made to fit inside the box, and rests on rests placed inside the same. This frame carries a fly-wheel shaft turned by a handle, and is furnished with a crank or excentric, and a connecting rod attached to a rubbing apparatus beneath the frame. The rubbing apparatus consists of a frame of the same width as the inside of the box, but shorter, so that the connecting rod can move it backwards and forwards in the box, so as to give the requisite rubbing motion for washing the clothes or other articles, which are placed between the rubbing apparatus and the ribbed false bottom of the vessel. This frame or rubbing apparatus has an open bottom and ends formed of transverse ribs of wood. The whole of the frame-rubbing apparatus and gearing can be raised up entirely clear of the box or vessel, and lowered again therein when it is required by a rack and pinion, the frame being furnished with guides sliding in grooves in the cast-iron standards of the machine. *Patent abandoned.*

487. J. & R. CUNNINGHAM. *An improved ornamental fabric, and improvements in weaving and in jacquard apparatus.* Dated Feb. 24, 1862.

This improved fabric is of the kind having two or more running covers of differently coloured wefts, there being, by this invention, a sort of, what may be termed, back warps introduced, which back warps the weaving action is made to interweave with the portions of the coloured weft ordinarily forming floats on the back of the fabric. In some cases, however, some of the wefts may be allowed to form floats, to be afterwards clipped or cropped off for the purpose of lightening the fabric. *Patent abandoned.*

488. J. C. HADDEN. *Improvements in small arms and artillery, and in projectiles for artillery.* Dated Feb. 24, 1862.

These improvements in small arms embrace a mode or modes of manufacturing the stocks of rifles with butts constructed so as to be capable of adjustment in respect of the bearing they may take against the shoulder, so that for sighting different objects, whether far or near, the position of the eye or head relatively to the shoulder may remain the same, the said mode or modes consisting of, and including the creating or providing for, the adjustment by a part or parts of the butt being either jointed upon a hinge or pin or joint placed longitudinally, or fitted upon dowels or pins, and removable into different positions, or by a sliding joint or dovetail or other suitable equivalent contrivance. The improvements in artillery consist in manufacturing the gun portions proper of field and other artillery, by surrounding a comparatively light core or inner tube or gun of great strength, such as muskets, metal, or steel, with a succession of girting pieces or lengths of hoops capable of being screwed into each other by screwed socket fittings, or of being otherwise screwed or fitted and fixed together, and in some cases the rearward length either holding a caseable, or a caseable and breech end, the main intention of the girting pieces being to afford weight or resistance against recoil, whether increased strength be or be not afforded by the addition. Certain of the improvements in projectiles have especial reference to projectiles intended to centre themselves in the bore of the gun as secured to the patentee by previous letters patent. One of these improvements consists in forming them with the swells or pro-

jections for receiving the twist situate at the rear of the projectile, and not at the front or forward portion, such swells or projections being either solid, that is to say, cast or formed in one, with the body of the projectile, or separate therefrom but fitted thereto. *Patent completed.*

489. R. WALLER. *Improvements in machinery and apparatus for joining leather and flexible and textile materials, and for the manufacture of boots and shoes and other coverings for the feet.* Dated Feb. 24, 1862.

We cannot here quote the details of this invention at sufficient length for an intelligible abstract. *Patent completed.*

490. T. BLAIR. *Improvements in machinery or apparatus for cutting, chopping, and breaking refined lump sugar and other substances.* Dated Feb. 24, 1862.

This consists in the use of an oscillating frame and sliding saw bench, each provided with an adjustable gauge to suit the size of the piece of sugar, which is made to slide or oscillate against ribband, band, circular, or vertical saws, whereby the piece of sugar is sawn into slices of any required thickness. These slices are deposited upon an endless web, and brought thereby into contact with a pair of feeding rollers, which move the slice forward to a certain point, where a knife descends and cuts the slice into long narrow strips. Motion is imparted to this knife by an excentric crank or other suitable mechanical contrivance. The cut strips or pieces are pushed forward by the action of the feeding rollers over a grating, by which arrangement the small or dust sugar is separated from the larger pieces or strips. After this operation the strips are made to enter a series of tubes or channels placed at an angle of about 45°, so as to allow of the sugar to descend by its own gravity until it comes in contact, at the lower ends of the tubes or channels, with a fence or gauge, placed in advance of a knife which falls upon the strips and severs a piece from the end of each at every tube or channel between the fence and the knife. These pieces are subdivided by small knives fixed at right angles into the before-mentioned knife, the sugar being by this time broken into fragments of the desired size for use. The machine may be made of any size and provided with any number of tubes or channels. *Patent abandoned.*

491. W. CLARK. *Improvements in apparatus for feeding or supplying steam boilers with water.* (A communication.) Dated Feb. 24, 1862.

This relates to improvements in the feed apparatus of steam generators, known as Gifford's "injector," and comprises among other features the following: 1, the steam from the boiler is introduced directly by a pipe into the first converging cone, which latter is fixed in the interior of the apparatus by bolts and flanges; 2, the dimensions of the annular orifice for the injection of the steam at the apex of the first fixed converging cone, may be varied and regulated by the conical part or core of a rod placed in the interior of said cone, which rod, and the conical part of same, are both movable by a screw attached to the end of the rod; 3, on leaving the first converging cone, the steam is immediately introduced into a second hollow fixed cone, formed by the exterior surfaces of the apparatus, which cone also converges, and is in direct communication with the feeding chamber, of which it forms the prolongation; 4, the dimensions of the annular injection orifice, at the apex of the second converging fixed cone, may be varied and regulated by a second and slightly conical enlargement or portion of the same rod which has already passed through the first converging fixed cone, which rod is also movable with the first portion thereof by the screw before mentioned fixed to the end of the rod. *Patent completed.*

492. T. N. KIRKHAM and V. F. ENSOM. *Improvements in bleaching and dyeing yarn and thread when in the form of cops, or otherwise wound.* Dated Feb. 24, 1862.

Here the bleaching or the dyeing liquor is introduced into the interior of a cop, or into a mass of yarn or thread wound into other forms, so that the liquor is pressed from the interior outward through the mass: thus, supposing the yarn or thread is wound into the form of cops, then hollow tubes, in the form of spindles, closed at the smaller ends, are introduced into the cops. These tubes are perforated or formed with numerous holes or passages, suitable for the free passage of the bleaching or dyeing liquor, or cleansing or washing fluid. By these means, when the liquid is forced through the passages in the tubes, the pressure of the liquid tends to separate the layers or coils of yarn or thread outwards, and by such means the liquid gets away in every direction, so that every part is fully acted on. The liquid may, after having been pressed through the tubes, in a direction from the motion outwards, be then drawn back by the open ends of the perforated tubes being put in connection with a suitable pump. When the yarn or thread is wound into masses or other form than that of cops, then suitably-formed tubes are introduced into the interior of the masses, and the liquids are similarly introduced into the interior, and caused to flow outwards. *Patent completed.*

493. P. G. B. WESTMACOTT. *Improvements in constructing and applying armour-plating to ships, vessels, and forts.* Dated Feb. 24, 1862.

For the purposes of this invention, armour-plates are composed of iron or steel, or of both iron and steel; the metal is made into the forms of rings or endless bars, which are shrunk one on the other until the desired dimensions and forms are obtained. The bars of which the rings are composed may be produced by rolling or hammering, or otherwise, and they may be shaped and welded into rings, or the bars or rings may be rolled endless, like to the way in which type-iron and other rings, cylinders, and endless forms are now sometimes made, or they may be otherwise constructed. *Patent abandoned.*

494. T. PARTRIDGE, Sen. *Improvements in apparatus for printing railway and other tickets or cards.* Dated Feb. 24, 1862.

We cannot here devote space to the details of this invention. *Patent completed.*

495. L. DAVIS and F. M. PARKES. *An improvement in the production or manufacture of gas for lighting and heating.* Dated Feb. 24, 1862.

This consists in producing or obtaining gas from the substance known as petroleum or rock oil, by subjecting it preferably in its crude state, that is to say, without previous purification, to considerable heat in a retort or like receptacle, until a gas is obtained from it. This gas the patentees generally pass through a condenser. They sometimes use a vertical retort, constructed double, so that the petroleum may be subjected to a high temperature at two rapidly succeeding intervals. The gas so produced is capable of being stored in a gaseous state for a greater or less time, and afterwards of being conveyed and distributed in a gaseous state for lighting and heating purposes, in the same way as the common coal gas now in use. *Patent completed.*

496. R. A. BROOMAN. *Improvements in reaping and mowing machines.* (A communication.) Dated Feb. 24, 1862.

This invention is not described apart from the drawings. *Patent abandoned.*

497. F. ST. GEO. SMITH. *Improvements in machinery for grinding or reducing quartz, bones, grain, and other substances.* (Partly a communication.) Dated Feb. 24, 1862.

This invention has for its object improvements in mills for grinding or reducing quartz, metallic ores, bones, bark, grain, and other mineral, animal, and vegetable substances. The patentee takes a cylindrical drum by preference toothed on the inner surface, and mounts arms on a spindle or axis, made to revolve very rapidly inside the said drum by means of a strap and pulley on the outer end of the spindle, or by any other means of communicating motion. The material to be operated upon is fed through an opening in the side of the drum near the axis, and the revolving arms meeting the material when inside the drum, dash it by centrifugal action with great violence against the internal circumference of the drum, whereby the material is broken to pieces. At one portion of the circumference he places an exit pipe, through which the particles, when sufficiently reduced, are driven by the blast of wind caused by the revolving arms. The exit pipe opens into a large chamber, in which the ground material subsides, and in the event of the comminution being required of different degrees of fineness, he makes the said chamber of considerable length. The largest particles subsiding first, and nearest to the entering end of the chamber, and so on down to the finest particles, allows of the separation being easily effected. *Patent completed.*

498. W. E. NEWTON. *Improvements in the joints or chairs of the permanent way of railways.* (A communication.) Dated Feb. 24, 1862.

This consists in shrinking the iron chair to the rails at their joint, and thus preserving the whole surface-bearing of the chair and rails, and making an externally solid and firm joint without the necessity of keys or wedges for holding the rails and chairs together. *Patent completed.*

499. J. CARNABY. *Improvements in turning, managing, and regulating the taps and valves of gas pipes.* Dated Feb. 25, 1862.

This invention is not described apart from the drawings. *Patent completed.*

500. J. WOODROW. *A certain improvement in the manufacture of hats or coverings for the head.* Dated Feb 25, 1862.

This relates to that part of hats or other coverings for the head called the brim, and especially to such brims as have the under side or surface covered with silk or satin, or other smooth substitute for plush, the present improvement being an extension of such covering to the upper surface also. The silk or satin is to be stretched over the upper surface of the brim, and passed over the edge to the under side in one piece, whereby the binding of the edge of the brim is dispensed with, and the upper surface is prevented from becoming disordered by the wearer. In the employment of plain or figured satin in one piece to cover the upper and lower parts of the brim, it will be evident that no binding will be required, consequently, the stitching usually required is dispensed with, and a thinner edged brim is obtained. The satin is cut in one piece to form the circumference of the brim, and sufficiently wide to cover the upper and lower portions, the same joining the ends being back-stitched at the back part of the brim. *Patent completed.*

501. D. WILKIE. *A composition to be used on the bottoms of sailing vessels and steamers for the prevention of barnacle and other matters adhering thereto while employed in sea water.* Dated Feb. 25, 1862.

This composition is made from the sea-weed commonly called "sea tangle" or "wreck," likewise a fluid extracted from haddock or other fish, which are to be amalgamated into one fluid or body. *Patent abandoned.*

502. J. PIDDINGTON. *An improved machine for shelling or husking all kinds of grain.* (A communication.) Dated Feb. 25, 1862.

This consists in constructing a machine for the above purpose in the following manner:—In a suitable framing the patentee adopts the following parts at the top and centre of the said framing. He fixes a hopper or funnel of sheet metal for supplying or feeding the grain into the machine, through a hole formed around a boss of the said casting. The said shaft is supported by its lower end in a step piece fixed to the bottom of the framing of the machine, and has a pulley fixed thereon for imparting rotary motion to the said shaft and to the horizontal plate before named. The under side of this said plate is furnished with a number of pieces of fine hard wire, set in gypsum, so as to form a kind of brush, the points of the wires projecting sufficiently beyond the gypsum to take off the shell or husk of the grain, which is deposited on a perforated circular plate beneath, fixed to another plate or casting bolted to the sides of the framing of the machine. This last-mentioned casting is formed with arms, from which proceed a number of concentric rings of metal, projecting upwards, the upper edge of each ring being formed sharp or knife-edged; at some distance below the rings aforesaid, another casting of a cup shape is fixed by its side or flange to the framing of the machine, and is used to receive the grain and loose shells or husks thereof. The operations of this machine are as follow: As the wire brush revolves, it rubs the grain which is on the perforated plates beneath the grain, and shells or husks removed thereon pass through the perforations in the said plate and fall into the receiver below; and it is this revolving brush and perforated plate operating upon the grain which constitutes the important feature of novelty in this invention. *Patent completed.*

503. J. PIDDINGTON. *Improved condensing apparatus adapted for high-pressure steam engines, especially locomotive engines.* (A communication.) Dated Feb. 25, 1862.

This invention is designed for effecting the following principal objects: 1, to prevent incrustation in the boiler; 2, to economise water; 3, to supply the feed water into the boiler at a temperature of 60° to 70° Beaumé; and lastly, to increase the effective power of high-pressure engines, and to economise fuel. *Patent abandoned.*

504. E. BLISS and H. CAMPLOUGH. *Improved means for viewing microscopic photographs and other minute objects.* Dated Feb. 25, 1862.

This consists in having a circular disc of metal or other suitable material, with small sight-holes perforated therein, at a convenient distance from the edge, and at a proper space apart, and placing opposite to each hole the photograph or object to be inspected, and having such discs and objects enclosed in a case with a microscopic lens fixed therein in the line of the holes in the disc, and a hole through the other side of the case directly opposite the lens, so that, by causing the disc to revolve, the objects placed on or connected with the disc may be brought seriatim in front of the lens in the case, and viewed through it. Of course, if the disc be of clear glass, no sight-hole will be required in it. The case may be caused to revolve by toothed wheels or other means. *Patent completed.*

505. W. CLARK. *Improvements in tobacco pipes.* (A communication.) Dated Feb. 25, 1862.

This relates to an arrangement of pipe by means of which the smoke is prevented from traversing the lower layers after escaping from the upper part. For this purpose the patentee makes use of an ordinary pipe of any form, material or dimensions, in the bowl of which he places a smaller hollow chamber or bowl, which serves for the passage of the smoke. Several rows of holes are made obliquely in the inner lining, so as not to be liable to choke with the ashes, which holes allow of the passage of the smoke into the annular space in communication with the suction tube or stem. *Patent completed.*

506. T. WATSON and R. DRACUP. *Improvements in means or apparatus for preparing and combing wool and other fibres.* Dated Feb. 25, 1862.

For apparatus for preparing and combing wool and other fibres, such fibres are operated by teeth in bars or instruments, to which a progressive motion is given by the simultaneous movement of pairs of toothed wheels; but it sometimes happens that, through such wheels being rigidly fixed to their shaft, and some obstruction either in the fibre treated or in the working of the mechanism arising, breakage takes place. The object of this invention is to remedy this evil by connecting such wheels to their shaft, so that, whilst uniformity of action may be secured, a yielding may take place when any undue obstruction arises. For this purpose the patentees connect the bosses of such pair of wheels together by a bar or bars, or other suitable connecting means, and apply a strap or collar to embrace the shaft, and they adjust the amount of adhesion thereto by set screws or other suitable means capable of adjustment to the pressure ordinarily desired to be exerted. *Patent completed.*

507. C. MINASI. *Improvements in cartridges, and in apparatus for facilitating the proper aiming with fire-arms.* Dated Feb. 25, 1862.

With reference to cartridges, this consists in so partially cutting, stamping, perforating, or acting upon their cases, covers or wrappers, that they will readily open, tear, separate, or part at a certain place or position, or places or positions, as required, before being placed in the gun. Also in manufacturing cartridges with a plug, stopper, cork, or other equivalent contrivance for holding in the powder and keeping it dry, and which is removed when the twisted end is broken off or removed. The invention comprises the constructing the stocks or supports to or upon which the barrels of rifles are mounted with the butts, or a part of the butt, hinged or jointed to the remainder or barrel, holding portion of the stock, by a pin or bolt passing through the two parts from side to side, so that by adjusting the position of the butt, the rifleman, whether firing at short or long range, may be enabled, while properly sighting the object aimed at, to place his eye or cheek as low down as may be convenient. *Patent abandoned.*

508. C. W. HECKETHORN. *Improvements in obtaining and applying motive power.* Dated Feb. 25, 1862.

Here the patentee makes a wheel, having, say, twelve hollow square spokes, with openings running their entire length either at the top only, or at both the top and bottom. In the spokes are tubes, containing a quantity of mercury, and running on twelve rollers. When the wheel is in motion, some of the tubes, that is, those on the descending side, will project beyond the periphery of the wheel, and the mercury will have run to the outer end of the tube, while on the ascending side the tubes will be brought close to the centre of the wheel (the mercury at the same time approaching the inner end of the tube) by one or two inclined planes (with or without the use of a cam) which carry the said tubes up, there being but one inclined plane required where there are openings at the top and bottom of the spoke. When the inclined plane is arranged between the openings, in which case an extra friction-wheel will be required, if there is an opening only on the upper side of the spokes, the tube has attached to it a metal rod projecting on both sides, and having wheels attached to it, which run on two inclined planes arranged on either side of the wheel. *Patent abandoned.*

509. J. IMRAY. *Improvements in hinges.* Dated Feb. 25, 1862.

These improvements apply, in the first place, to a mode of constructing cast iron hinges of the kind commonly known as collinges or spherical hinges. The joint of such a hinge ordinarily consists of a wrought iron or steel ball-ended pivot, which is fixed tightly in the knuckle, the ball end of the pivot being made true and smooth, so as to turn freely in a cup which forms the step of the hinge; but instead of making the pivot a separate piece from the knuckle, and fixing it thereon, the patentee chill casts the pivot in one piece with the knuckle, and afterwards renders it smooth by scouring it with emery or other suitable polishing material. The improvements apply, in the second place, to the construction of spring hinges, and the shoes, centres, or hangings used in connection therewith. *Patent completed.*

510. J. WHITWORTH. *Improvements in manufacturing projectiles.* Dated Feb. 25, 1862.

According to this invention projectiles are made having the required regularity or shape by placing the projectile in a chuck, and turning the fore and rear parts simultaneously, or by consecutive operations, without removing the projectile from the chuck in which it is held. The patentee uses for this purpose a machine having a holder or chuck, in which the projectile is held in the middle, or intermediate of its length, and the machine is arranged so that the chuck may be made to revolve, and so that the tools which produce the required shapes to the ends may be moved up to and from the fore and rear parts respectively of the projectiles; or the projectile may be held and presented to revolving tools. In applying to projectiles suitable lubricating materials, a portion of the surface is coated with the lubricator applied in spiral strips or ribs, that is to say, those parts are coated or more thickly coated, which, when the projectile is in the rifled

barrel, correspond with its grooves or recesses, by which means provision is made for easy loading without greatly reducing the diameter of the projectile. The projectile may be covered with paper or a thin metallic or other suitable coating to prevent the barrel from leading, and in that case the lubricator is applied, or more thickly applied, spirally upon the covering material. *Patent completed.*

511. W. MC. I. CRAUSTON. *Improvements in machinery for reaping and mowing.* (Partly a communication.) Dated Feb. 25, 1862.

One object here is to keep the cutting apparatus as nearly in line with the axle or centre of the driving wheel as possible, and at the same time to so unite the finger and cutter bar to the main frame as that they may be raised up or let down as circumstances may require. Another object is so to construct a track clearer, and to so apply it, that the act of drawing it along the land shall cause it to rotate. *Patent completed.*

512. C. KINGSFORD. *A new composition for the manufacture of bread.* Dated Feb. 25, 1862.

The object of this invention is to form such a composition with flour as will, when submitted to the usual mixture with water or milk for the purpose of making dough, give rise to the escape of carbonic acid gas in sufficient quantity to "lighten" or "make porous" the dough, and so render yeast or other fermenting agent unnecessary. The patentee grinds into fine powder, separately, tartaric acid, bicarbonate of soda, and common salt, and mixes them thoroughly together in the following proportions, that is to say:—Tartaric acid, 25½ ounces; bicarbonate of soda, 27 ounces; common salt, 14 ounces, making together 66½ ounces, which he mixes with 196lbs. of flour, taking care that the whole mass is completely incorporated. *Patent completed.*

513. P. J. GUYET. *An improved coupling for uniting pipes between locomotives and tenders, also applicable to the coupling of other pipes.* Dated Feb. 25, 1862.

This invention is not described apart from the drawings. *Patent abandoned.*

514. H. W. COOK. *An improved mode of, and apparatus for, propelling by means of electricity.* Dated Feb. 25, 1862.

This relates to a new and improved mode of, and apparatus for, propelling carriages by electricity. In order to effect this object, the patentee makes use of that attractive power or force which a coil or helix exerts upon or induces in a bar of soft iron (placed as a core within its spiral) during the passage through the length of the wire of an electric current, and which attractive force is the force or power known in physics as the axial force. The iron bar being about the length of the coil, air attractive force is exerted or set up, and tends to bring the centre of the coil to a position identical with that of the centre of the bar. He proposes then, by suitable arrangements, to make use of this force for the production of motion in a continuous, rectilinear, or other direction. *Patent completed.*

515. J. BOOCOCK and T. DAVENPORT. *Improvements in machinery for preparing, spinning, and doubling cotton and other fibrous materials.* Dated Feb. 26, 1862.

The 1st part of this invention, which is applicable to slubbing frames, intermediate frames, and roving frames, or any other machines of the like nature for preparing cotton or other fibrous materials to be spun, consists in causing the bobbins and rollers to revolve in a frame, which frame also revolves on its own axis, for the purpose of putting any requisite amount of twist into the fibrous material, at the same time that it is being wound on the bobbins. In performing this part of the invention, the inventors mount both rollers and bobbins in frames or suitable bearings, and cause the rollers to revolve by bevil wheels, friction rollers, or in any other convenient manner, such motion being communicated from the spindles on which the above-mentioned frames are mounted. The 2nd part consists in an improved method of giving motion to the lifting rails or equivalent parts of machines for preparing, doubling, &c., and also in an improved tapering-off motion. In performing this part of the invention, they cause the heart lappet of such machines to actuate a lever, one end of which is fixed to the machine in any convenient place; to this lever is fixed a ratchet wheel and lappet, which actuate a stud moving in a radial slot in the said lever; a catch which is fixed to the frame causes the ratchet wheel to move one or more teeth every time the lever descends, and by this means the traverse or guide is shortened and the tapering off at the ends of the bobbins effected; when the bobbin is full, the stud has reached the end of the radial slot, and actuates the knocking off motion for stopping the machine. *Patent abandoned.*

516. A. GREEN. *Improvements in machinery for bordering paper, envelopes, and cards with black or coloured borders.* Dated Feb. 26, 1862.

These improvements in the method and apparatus for bordering paper, envelopes, and cards with black or coloured borders consist in fitting to each side of a table or bed of any desired length and width a movable guide, carrying a series of pins, their distance apart being regulated according to the width or depth of border desired; or, instead of pins, corrugated metal, or other suitable contrivance, may be fixed in the guides. The guides are free to move up and down in slots over screws which enter the sides of the bed. Bars connect each end of the frame, and support a shaft extending beneath the bed the whole length thereof, and carrying a toothed wheel at each end, into the teeth of which a ratchet works, whereby the frame is raised, to raise the pins above the surface of the table, or lowered to lower them, and let them lie flush with or below the surface thereof. The paper envelopes or cards are placed in the spaces between the pins; the guide is lowered, the ink or colour applied in the ordinary manner, and the paper removed. *Patent completed.*

517. A. STEPHEN, junior. *Improvements in the construction of ships or vessels.* Dated Feb. 26, 1862.

The object here is to prevent or diminish the injurious corrosion supposed to arise from galvanic action, such as that hitherto occurring where the constructive details of ships or vessels have consisted of two different metals and wood combined and disposed so as to be accessible to moisture; and the invention consists in applying to such parts a protecting impervious or non-conducting covering, coating, or varnish of a viscous, resinous, bituminous, or vitreous substance, such as waterproof glue, or a waterproof or insoluble cement, such as Portland cement, or a combination of such coverings, coatings, or varnishes may be applied to the said parts. This improved treatment is designed in constructing ships or vessels of wood and iron combined; as, for example, with frames of iron and planking of wood, and with or without an external sheathing of copper or other metal or alloy different from iron; and it is equally applicable in all cases wherein different metals are combined in such a way, and are so situated or disposed as to be accessible to moisture or water. *Patent completed.*

518. G. DAVIES. *Improvements in emptying or draining the water from careening docks in maritime ports.* (A communication.) Dated Feb. 26, 1862.

This consists principally in the utilisation of the tides for the purpose of effecting the necessary drainage, which system appears to result from the very nature of the operation in tidal ports. The ordinary process is to admit the vessel into the dock at high water, and, placing it in the required position, to allow the water to ebb until it has attained its lowest level; the dock gates are then closed, and the draining commences. It will be readily understood that a reservoir might be made near to the dock into which the water is admitted, and retained at the high water level by the closing of a shuttle or sluice, and when the time of drainage arrives, the water retained in the reservoir may be used to actuate a tubular or other hydraulic machine, which, giving motion to the pumps, will effect the emptying or draining of the dock. *Patent abandoned.*

519. G. REES. *Improvements in the construction of marine sub-ways.* Dated Feb. 26, 1862.

This consists in the use of a floating caisson or chamber, having an opening above the surface of the water, within which chamber the construction of the sub-way is carried on. The sub-way is formed of a tube, or series of iron tubes, flanged internally, cylindrical being preferred. On one side of the chamber there is an opening corresponding to the size of the tube, and sliding thereon in a water-tight manner. As the tube is lengthened, the chamber is pushed forward, and clay, stones, concrete, or other suitable substances, are brought into the chamber through the tube, and elevated and deposited on the outside thereof, so as to form a support and protection for the sub-way as it is completed. *Patent abandoned.*

520. A. D. DUPARET. *Improvements in the ornamentation of tissues.* Dated Feb. 26, 1862.

This consists in ornamenting crape, muslin, gauze, or other similar transparent or light tissues, such as cashmere, by painting on such tissues (previously stretched on a proper frame) flowers, foliage, or other similar ornaments, by painters' pencils and water colours mixed at the moment. The same are to be used with gelatine dissolved in water by a water bath. *Patent abandoned.*

521. J. DOTHEE. *Improvements in the colouring or dyeing of horse-hair tresses, hats, or ornaments.* Dated Feb. 26, 1862.

This consists in colouring or dyeing horse hair, &c., in any required shade, by vegetable or mineral colours mixed up or diluted with spirits of wine, collodium, or other suitable rapidly volatizing menstruum, or a mixture of two or more of such menstrua, which, by rapidly volatizing, do not allow sufficient time for the horse-hair to crisp or distort, as would be the case if other non-rapidly volatizing menstrua were to be made use of. *Patent abandoned.*

522. J. H. BENNETT. *Improvements in steam generators, and in engines to be worked by atmospheric pressure, or steam and air combined.* Dated Feb. 26, 1862.

This consists in employing a small supplementary boiler and furnace. An air pipe is entered into an ordinary boiler without a furnace, and is passed to the back, and then brought to the front, or circulated in any other way, and then passed into the supplementary boiler, at the top of which there is a pipe connected with the ordinary boiler for the purpose of supplying it with steam and hot air. Cold air is forced into the air pipe by a fan-pump or other contrivance, and water is supplied to the supplementary boiler in the usual way. When heat is supplied to the supplementary boiler, steam is generated, and the air forced through the pipe in the ordinary boiler becomes heated, which hot air, with the steam, passes into the ordinary boiler and heats the pipe, and causes the continual supply of air to become heated as it passes onwards to the supplementary boiler. The improvements in engines worked by air and steam combined, consist in the use of one or more cylinders provided with slide or other valves, and forming a vacuum on one side of the piston or pistons, and using air either singly or combined with steam for the pressure. The crank shaft of the engine has cranks for working the pumps which form the vacuum, and supply air to the pipes which pass through the boilers. The inventor also uses air, either singly or combined with steam, in connection with a vacuum for working rotary engines. In the interior of a stationary cylinder there is a shaft working in suitable bearings. To this shaft is fixed an inner wheel, having upon it projections working against the interior of the cylinder, and acting as a piston. At both ends of the stationary cylinder on the outside are bands for the purpose of holding the packing and keeping the parts tight. *Patent abandoned.*

523. T. KING and R. VARVILL. *Improvements in apparatus for controlling the flow of fluids for flushing water-closets.* Dated Feb. 26, 1862.

This relates to the apparatus immediately in connection with the cistern containing the flushing fluids, and, though applicable to all cisterns, is especially so in large towns, where a small or intermediate cistern is supplied from the street mains, or from a cistern at an elevation, the object being to prevent the waste of the said flushing fluids. To the ordinary connections of the hand-lift or pressure-seat arrangement the patentees joint, or otherwise connect, a lever, which is carried into the cistern, and balanced or supported on the end of the horizontal plug or barrel of a tap fitted to the supply pipe. On the other end of this lever is affixed the float, and between the said tap and float is attached a chain or lever, which reaches to, or near to, the bottom of the cistern, and operates the overflow or flushing-valve. The overflow pipe is cast with the cistern, and communicates with the flushing or waste-pipe in the usual way. By this arrangement, when the part of the lever outside the cistern is acted on, the float will be raised, the supply-tap shut, and the outflow or flushing-valve opened; but as soon as the lift or pressure-seat is left at freedom, the float falls and opens the supply-tap, until such time as the cistern is again filled, thus preventing more than the quantity contained in the cistern from being used by one movement. *Patent completed.*

524. J. CLIFF. *Improvements in glazing stoneware, red clay ware, porcelain, and other kinds of earthenware.* Dated Feb. 26, 1862.

This consists in using in lieu of the ordinary kiln with open fires, ovens, furnaces, or chambers for glazing goods, an oven or kiln heated by flames or jets of gas, thus generating heat without deposition of ash or dust on the goods. When such furnace is sufficiently heated, common salt, metals, salts, or other glazing materials or agents may be applied directly amongst the goods or slabs or open saggers containing the goods in the ordinary way, namely, in at the furnace mouths, or by scattering from orifices in the top or sides of said furnaces. *Patent completed.*

525. W. MILLER. *Improvements in the manufacture of sugar.* Dated Feb. 26, 1862.

This invention is not described apart from the drawings. *Patent completed.*

526. C. L. KNOLL. *Improvements in pianofortes.* Dated Feb. 26, 1862.

Here in oblique and cottage pianofortes the hammers are caused to strike from the back of the instrument against the strings or scale, whereby the body of the instrument may be extended in width beyond that of the key board. The patentee employs a compound rest plank, formed of wood, with a plate or bar of iron at the upper and lower surface thereof, the whole being covered with sheet or cast brass. The balance key pins have their upper ends made of an oval shape in horizontal section, and are so fixed in the key frame that their transverse diameter shall be parallel with the lines of the slots and keys. *Patent completed.*

527. W. CLARK. *Improvements in the clasps or fastenings of bracelets, neck chains, and other articles of jewellery.* (A communication.) Dated Feb. 26, 1862.

This catch is formed of an elastic strip, which itself forms the spring, and is bent so as to form two arms. It is fixed rigidly or jointed to one part of the ornament. In this strip the patentee also makes a cavity which receives a projecting point formed inside of the socket, plate, or part into which the spring enters. *Patent completed.*

528. E. G. BRUZAUD. *Improvements in pianofortes.* Dated Feb. 26, 1862.

This consists in combining with the strings of each note, at or near the bass end of the instrument, two dampers which come in contact with the strings at two points in their length at a distance the one from the other, whereby the vibration of the strings is checked. *Patent completed.*

529. W. P. SAVAGE. *Improvements in firearms.* Dated Feb. 26, 1862.

Here the patentee applies, immediately behind the trigger guard, in the small of the butt where it is grasped in firing, a lever mounted on a centre, kept in position by a spring, which tends to project it out a short distance from the stock, so that the hand, in grasping the piece in the position for firing, may move the end of the lever inwards. He causes the lever to act on a stud, pin, &c., which stands up in front of the half bent of the tumbler in such position that, were the tumbler released by the sear, it would be immediately caught by the stud or pin. When the piece is grasped for firing, the movement so produced in the lever withdraws the stud or pin. *Patent completed.*

530. J. MEDHURST. *Improvements in apparatus for reefing and furling the top sails, courses, and other square sails of vessels.* Dated Feb. 26, 1862.

For the purposes of this invention, in arranging top sails and other square sails (except courses) the yard is made of iron, and hollow; and there is a bar or tube by preference of iron cased with wood in the centre of the hollow part, and somewhat exceeding the breadth of the head of the sail in length. This bar or tube is so arranged that it can revolve on centres or bearings at its ends. On this bar or tube the sail is laced, and when it is made to revolve, the sail is wound around it. In order to reef the sail, the yard is lowered, and the sail is at the same time wound up upon the bar or tube which is caused to revolve. The apparatus is attached in the following manner:—A chain from the deck passes through a sheave in the mast over the yard, and then around a chain wheel fixed to and above the yard at the slings; the chain then passes up and around a second sheave on the mast, and then returns to the deck, so that, when the yard is lowered by slacking off one end of the chain, the whole weight of the sail roller and yard being pendent on the chain, will cause the chain wheel to revolve. This chain wheel puts in motion two axes extending in either direction towards the extremities of the yard; these have pinions at their ends which gear with cog wheels at the ends of the roller to which the sail is attached. As a security against the roller being bent or otherwise damaged by the wind blowing in the sail, there is a broad hook made by preference of sheet iron, and so placed as to support the middle of the roller; this hook is connected with a purchase, so that when the sail is set, or after it has been reefed, the hook may be made to take the weight of the sail. Both ends of the sail are arranged so that they may be hauled on or slacked off from the deck, so that any amount of rotation may be given to the roller. *Patent completed.*

531. J. SMITH, Sen. *Improvements in drying wheat and other grain.* Dated Feb. 26, 1862.

These improvements consist in causing the air used for raising grain to be heated, and to be used in a heated state, by which the grain will be dried and improved when being raised. *Patent completed.*

532. G. TORR. *Improvements in and an improved apparatus for manufacturing and re-burning animal charcoal.* Dated Feb. 27, 1862.

This invention is not described apart from the drawings. *Patent completed.*

533. S. ADAMS. *Improved arrangements for effecting an equilibrium of fluid or gaseous pressure upon other valves.* Dated Feb. 27, 1862.

This invention has for its object the production of an equilibrium of the steam fluid or gaseous pressure on the valve, by causing the steam fluid or gas to act with equal pressure on opposite sides of the valve at the same time, thereby obviating the loss of power caused by the unbalanced pressure on the valves as they are ordinarily constructed and arranged. For this purpose, recesses are formed in the door or front of the slide valve box, or in the valve, in such situations as to admit of the steam fluid passing at the same time to opposite sides of the valve. There are also passages through the valve, so as to form communications between the ordinary ports leading into the cylinder and the recesses. By this arrangement the pressure on the valve of the steam fluid, as it enters or escapes from the cylinder through the ordinary ports, is balanced by the pressure of the same on the opposite part of the valve, thereby effecting a constant equilibrium of pressures on the valve. *Patent completed.*

534. C. Clark. *Improvements in tea and other trays for the table.* Dated Feb. 27, 1862.

This invention consists in making trays for the table with a movable or rotating plate, upon which the tea, coffee, and other services are placed so as to be filled from the urn as they move or revolve therewith. *Patent abandoned.*

535. W. A. Gilbee. *Improvements in the construction of fire-grates for steam and other boilers, and suitable to all kinds of fires.* (A communication.) Dated Feb. 27, 1862.

This consists in constructing grates with fire-bars, having conical, tubular, or other shaped recesses or grooves formed in them, and arranged in a line with each other in the length and breadth of the furnace, and permitting the circulation of air received from without by suitable openings in the front and around the grate. The bars are placed parallel to the door of the furnace. The grate is formed by placing a number of the said fire-bars side by side and parallel to each other. The recesses of the bars begin at the entrance of the furnace, the framework and plate of which are perforated with holes corresponding, and in a direct line with the recess in the fire-bars, for the admission of the air into the furnace. *Patent abandoned.*

PROVISIONAL PROTECTIONS.

Dated May 31, 1862.

1617. I. Villa, 12 Denmark Street, Soho. A new and improved method of exhibiting terrestrial and astronomical phenomena, and of facilitating the solution of problems relating thereto, without the aid of calculation.

Dated July 21, 1862.

2075. W. Clark, 53 Chancery Lane, engineer. An improved pomade or balsam. (A communication.)

Dated August 7, 1862.

2215. R. A. Brooman, 166 Fleet Street, patent agent. Improvements in covering ships and vessels built of wood, or iron ships with a backing of wood, before placing iron, steel, or other armour plates on such ships and vessels. (A communication.)

Dated August 9, 1862.

2236. G. T. Bousfield, Loughborough Park, Brixton. Improvements in apparatus to be used in the manufacture of hat bodies. (A communication.)

Dated August 14, 1862.

2280. A. Walker, Liverpool, optician. A new instrument to determine or ascertain the depth of water and the distance a ship has run.

Dated August 16, 1862.

2306. R. Barclay, Paris, Canada West, watch and clock-maker. Improvements in chronometers and other time-keepers.

2308. C. H. J. W. M. Liebmann, Huddersfield, merchant. Improvements in machinery for finishing textile fabrics.

2310. M. Iturriaga, Colonel in the Army of Her Majesty the Queen of Spain, Tavistock Street, Bedford Square. Improvements in fire-arms.

Dated August 18, 1862.

2312. G. Chapman, Edinburgh, gentleman. Improvements in reaping machines.

2314. J. Cuneg, Great James Street, Bedford Row. Improvements in depositing silver and other metals on fabrics and other materials.

2316. W. E. Newton, 66 Chancery Lane, civil engineer. Improvements in connecting plates, sheets, or slabs of metal or other materials, and fastening the same on to framing applicable to armour-plating for ships, vessels, or batteries, and to roofing and other similar purposes.

Dated August 19, 1862.

2320. T. Wilkinson, Rathmines, Dublin, commercial clerk. Improvements in machinery or apparatus for singeing pigs.

2322. G. H. Dembinski, 13 Rue de l'Oratoire, Paris. A motive apparatus, and processes proper for giving to it a continuous motion and unlimited strength.

2324. W. J. Hoyle, engineer, and J. Proven, millwright, Halifax. Improvements in mechanism and arrangements for supplying lubricating matter to the cylinders of steam engines, and to the bearings and other surfaces of mechanism.

Dated August 20, 1862.

2326. J. G. Tongue, 34 Southampton Buildings, Chancery Lane. Improvements in processes and apparatus for extracting the natural wax or fatty matters from wool, hair, or other animal or vegetable substances containing the same, and in the application thereof to various useful purposes.

2328. C. Callebaut, 2 Rue Sainte Appoline, Paris. Improvements in sewing machines.

2330. W. H. Hutchinson, Newton Heath, near Manchester, starch manufacturer. Improvements in the manufacture of ammonia and the prussiates of potash or soda, and in apparatus employed in such manufactures.

2331. J. Standish, Egerton, near Bolton, and J. Gooden. Improvements in machinery or apparatus used in the preparation of cotton, wool, flax, or other fibrous materials to be spun.

2332. S. Wilkes, Rue St. Honore, Paris. An improved attachment for door knobs.

2333. C. Chinnock, Brooklyn, New York, merchant. Improved construction of corkscrew.

Dated August 21, 1862.

2334. S. J. Paris, Manchester, engineer, and W. Bate, Salford, telegraph engineer. Improvements in alphabetical electric telegraphs.

2335. J. C. Schemmann, Hamburg, merchant. Improvements in the manufacture of steel.

2337. G. Davies, 1 Serle Street, Lincoln's Inn, civil engineer. Improvements in governors for steam engines.

2338. T. Clements, managing engineer, and P. Llewellin, John and J. W. James, brass founders, Bristol. Improvements in the construction of a self acting lubricator for lubricating various parts of steam engines.

2340. A. Boubée, Paris. An improved veil protector.

Dated August 22, 1862.

2341. S. F. Griffin, New Adelphi Chambers, civil engineer. Improvements in apparatus to be used in the distillation of petroleum or any oleaginous, resinous or alcoholic bodies.

2344. W. Barrett, Norton Furnaces, near Stockton-on-Tees. Improvements in casting railway sleepers and chairs where tie bars are used.

2346. J. Mackay, Glasgow, manufacturing chemist and importer of foreign goods. Improvements in the manufacture of soap powder.

2347. R. Harrington, Northampton Street, Birmingham, manufacturer. Improvements in umbrellas and parasols, and in the manufacture of parts thereof.

2349. D. Moore, Brooklyn, of Kings and state of New York. Improvements in breech-loading fire-arms.

2350. G. Bottomley, Leeds, gentleman. Improved apparatus for expressing moisture from pulpy or solid substances.

2351. D. Moore, Brooklyn, of Kings and state of New York. Improvements in revolving fire-arms.

2352. W. Carwood, Stepney, engineer, W. Boas, Bromley, engineer, and C. Colwell, Belvedere Place, Southwark, gentleman. Improvements in apparatus for propelling ships and other vessels.

2353. T. Wood, Manchester, engineer. Improvements in the slide valves of steam engines.

Dated August 23, 1862.

2357. M. K. Angelo, Gloucester Place, Portman Square. Improvements in apparatus used in the manufacture of shell-lac.

2358. M Henry, 84 Fleet Street. Improvements in stuffing boxes and their packings. (A communication.)

2359. C. H. Roeckner, Marsh Street, Bristol. Improvements in syphons for discharging or drawing off large bodies of water, and in the mode of charging, fixing, and constructing same, whereby they are rendered permanently self-acting.

2360. W. E. Newton, 66 Chancery Lane, civil engineer. Improvements in the mode of and apparatus for treating fermentable substances for brewing and distilling. (A communication.)

Dated August 26, 1862.

2368. J. Rider, Basinghall Street, Leeds, iron merchant and engineer. Improvements in the construction of fencing posts or standards, to be used either for straining or otherwise sustaining fences; the said improvements being also applicable to all kinds of gate posts, telegraph poles, signal posts, or other upright standards or pillars.

Dated August 27, 1862.

2370. A. Crichton, Glasgow, mechanic. Improvements in looms for weaving ornamental fabrics.

2372. H. Harben, Oxford Villa, Haverstock Hill, gentleman. Improvements in the manufacture of paper and other productions in which fibrous material is employed.

2374. R. Sims, Bedford Foundry, Leigh, agricultural implement makers and ironfounders. Improvements in machinery or apparatus for pulping, stripping, or slicing turnips and other vegetable substances.

2378. W. M. Mayes, Hoxton, civil engineer. An improvement in, or addition to, wheels particularly applicable to the wheels of railway and other carriages.

2380. W. E. Newton, 66 Chancery Lane, civil engineer. An improved method of producing light for the various purposes of artificial illumination. (A communication.)

2382. A. V. Newton, 66 Chancery Lane, mechanical draughtsman. Improved machinery for printing from engraved plates. (A communication.)

2384. J. J. Potter, 3 New Bridge, Dover. Improvements in upright pianofortes.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

2386. M. A. F. Mennons, 24 Rue du Mont Thabor, Paris. Improvements in smoke-consuming furnaces. (A communication.) *Dated August 8, 1862.*

2387. M. A. F. Mennons, 24 Rue du Mont Thabor, Paris. An improved assorting apparatus applicable to the numbering of raw silks. (A communication.) *Dated August 28, 1862.*

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

1211. P. R. Drummond. Rake.

1222. L. M'Lachlan. Governing or regulating light.

1223. E. A. L. Negretti and J. W. Zambra. Mercurial minimum thermometers.

1234. H. W. Hart. Manufacture of reflectors.

1236. G. H. Smith. Manufacture of crinoline or elastic hoops for dresses.

1246. H. F. Wells. Screw clamps or cramps for joiners' and other work.

1250. S. W. Newington. Apparatus for letting off and stopping the flow of liquids from casks and vessels.

1251. E. Clark. Improvements in arches. (A communication.)

1256. W. L. Tizard. Heating, cooling, and condensing apparatuses.

1257. D. M. Childs. Steam engines. (A communication.)

1258. D. M. Childs. Reaping and mowing machines. (A communication.)

1259. D. M. Childs. Changing a rotary into a reciprocating and a reciprocating into a rotary movement in machinery. (A communication.)

1264. E. Moore. Shirts and dresses.

1265. A. Travis & B. Travis. Engines for carding cotton.

1270. A. T. Mercier. Looms.

1271. J. Maiden. Lamps.

1275. J. Oxley. Cutting and chopping bread and other substances.

1276. G. H. Birkbeck. Couches or settees. (A communication.)

1277. J. M. Carter. Harness and the shafts of carriages.

1279. W. Staufen. A new material to be used in the manufacture of brushes.

1280. J. L. Norton. Drying fibrous materials and yarns.

1281. J. M. Napier. Projectiles.

1284. H. Willis. Valves for the supply and discharge of gaseous bodies.

1286. W. T. Loy. Carding cotton. (A communication.)

1291. W. & T. Huntington. Machinery for the manufacture of bread.

1300. C. F. Whitworth. Signalling upon railways.

1307. H. Juhel. Wheels. (A communication.)

1309. E. Ormerod and C. Schiele. Apparatus for cutting or dressing stones.

1311. J. M. Herdevin and J. A. Jullien. Sluice cocks.

1318. J. Fowler. Engines for hauling agricultural implements.

1321. J. & T. Mellodew and C. W. Kesselmeyer. Looms.

1322. C. Schlickeysen. Machinery for moulding bricks.

1323. J. Heyworth. Looms.

1325. A. Williams. Form or seat.

1327. L. G. Perreaux. Clocks.

1329. T. Wilson. Armour plates for ships of war.

1331. T. F. R Brindley. Travelling and other flasks.

1335. R. Burley. Using ordnance under water.

1337. J. Roscoe. Lubricator.

1344. R. Mills. Washing, wringing, drying, and mangling machines.

1347. P. Chenaillier. Concentrating liquids.

1351. W. Greaves. Stirrup bars.

1354. W. Clark. Printing apparatus. (A communication.)

1360. P. H. Colomb. Apparatus for signalling.

1361. T. Markland. Wearing apparel.

1364. N. Wood and J. Stockley. Grinding, smoothing, and polishing plate glass.

1367. R. A. Brooman. Swings. (A communication.)

1369. G. T. Bousfield. Applying steam power to tilling land. (A communication.)

1382. G. C. Grimes. Cigar lights, splints, matches and tapers, or vestas.

1398. F. J. Bolton. Telegraphing.

1399. F. J. Bolton. Displaying the lights in lighthouses.

1406. J. T. Cooke. Battens used in weaving.

1435. P. M. Lopez. Sowing wheat or other grain.

1467. J. Dicker. Delivery of bags or parcels from railway trains.

1907. J. Hartshorn. Lace.

1940. W. M. Williams. Distillation of coal and peat.

1983. W. F. Reynolds. Watch pendant.

2075. W. Clark. Pomade or balsam. (A communication.)

2128. H. Bollinger. Ship building.

2221. F. M. Jennings. Coating ships' bottoms.

2267. J. Cooper. Valves and buckets for pumps.

2337. G. Davies. Governors for steam engines. (A communication.)

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Dated September 5, 1862.

604. J. Barker.

607. J. G. Shipley.

612. J. Fowler, D. Greig, and R. Noddings

613. T. Ball, W. Ball, and J. Wilkins.

616. R. Restell.

617. T. H. Wood.

619. A. W. Williamson.

621. G. Edmonson.

622. A. Blair.

625. W. Paterson, W. A. Sanderson, and R. Sanderson, junior.

626. J. Deane.

628. P. J. Guyet.

631. W. Palmer.

640. R. A. Brooman.

641. W. Parker and G. H. Batman.

642. W. Spence.

646. A. Barclay.

648. J. T. Calow.

652. J. Nadal.

656. O. & J. Kerautret.

657. E. G. Camp.

658. C. Hall.

659. T. B. Wilson and W. Wilson.

662. G. Davies.

670. J. Johnson.

671. W. Conyers.

674. A. M. A'Beckett.

701. A. Quinard.

710. W. Turner.

717. W. M'Adam.

718. J. Hunter.

721. S. N. De la Haye de Barbezières.

731. L. P. Mongruel.

746. M. A. F. Mennons.

771. J. Cumming.

797. E. Lord.

807. M. Henry.

815. E. Morewood and A. Whytock.

825. E. Morewood and A. Whytock.

836. R. Boby.

842. A. V. Newton.

913. H. Smith.

1108. W. E. Newton.

1162. C. Callebaut.

1261. W. E. Newton.

1282. A. H. Fielden.

1419. J. B. Pope.

1812. J. B. Wood.

1845. G. Haseltine.

1884. E. Hunt and H. D. Pochin.

2040. A. V. Newton.

PATENT ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1966. B. Baugh.

LIST OF SPECIFICATIONS PUBLISHED

During the Week ending September 6, 1862.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s. d.		s. d.		s. d.		s. d.		s. d.		s. d.
213	0 4	224	0 4	235	0 4	246	0 10	257	2 0	268	0 4
214	0 10	225	0 4	236	0 4	247	0 4	258	0 4	269	1 0
215	0 4	226	1 0	237	1 0	248	0 4	259	0 4	270	0 8
216	0 4	227	0 8	238	0 10	249	0 10	260	0 4	271	0 4
217	0 8	228	0 4	239	4 4	250	1 0	261	0 4	272	0 4
218	0 8	229	0 6	240	0 10	251	0 4	262	1 0	295*	0 4
219	0 8	230	0 4	241	0 4	252	0 10	263	0 4	...	...
220	0 4	231	0 8	242	1 2	253	0 4	264	0 4	...	...
221	0 4	232	0 4	243	0 4	254	0 8	265	0 4	...	...
222	0 4	233	0 4	244	0 4	255	0 4	266	0 4	...	...
223	1 6	234	0 8	245	0 8	256	0 4	267	0 4	...	...

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, SEPTEMBER 19, 1862.

ENGINEERING SUMMARY.

THE gigantic scheme of the Canal of Suez is likely to be a perplexing one. Even now, while the works are in progress, it is considered by some to be very doubtful whether the enterprise will succeed, in consequence of the political and engineering difficulties which it involves, the vast expense attending it, the extension of time required for its completion, and the little prospect which the shareholders have of ever making it remunerative. An opinion has, indeed, been expressed, which, though a melancholy one, seems to all probability likely to be correct—that the present generation will not witness the completion of this grand undertaking. The canal which is to extend across the isthmus from Suez to Port Said on the Mediterranean, is intended to be 91 English miles long, and from 260 to 320 feet in width, its depth being everywhere 26 feet. The alimentary canal connects the chief canal with the Nile, and this portion of the work supplies the means of conveying the requirements of the contractors in the execution of their work. This canal is a double one, and consists of a provisional canal, 5 feet broad and 2 or 3 feet deep, while the proper canal of the valley is intended for navigation and irrigation, and is about 16 feet wide by 3 or 4 feet in depth. These two run side by side. At the Lake Timsali the alimentary canal is joined by the great ship canal, which is surrounded by a large number of extensive storehouses and workshops. Here the number of houses and buildings for the workmen have given the locality the aspect of a town, and churches and a bazaar, &c., have also been erected. It appears, though the width of the work has been considerably reduced, it will be about 180 feet wide, but 91 feet only have been at present excavated. Through the ridge of sand a passage has been cut, which, when widened, will form the entrance to a harbour about to be formed in the lake. A report recently published of a visit to these works by Mr. Percy Badger, informs us that "an embankment and an unfinished quay exists at "one side of the entrance to the harbour," and that only 150 yards of the eastern pier have as yet been built, although there are to be two of them, which it was proposed to project somewhere about 7,550 feet. The pamphlet strongly condemns the "insignificant results" which have accompanied the labour of three years in this gigantic scheme, and the expenditure of two-fifths of the company's capital. The success of the canal seems to tremble in the balance, and the tremendous outlay required will, in our estimation, go far to make the project an unsuccessful one.

The meeting of the Royal National Lifeboat Institution was held last week, and the monthly report, recorded the interesting fact of the inauguration of a new lifeboat at Withernsea, near Hull, which was witnessed by upwards of 20,000 persons. Not the least important item was the account of the visit of some French officers to the society's stations on the north-east coast, as it drew from them an expression of their sincere admiration of the working of this humane institution. We believe there are 122 lifeboat establishments, and a large amount of money is annually laid out upon them. The society is evidently worked well, and deserves the support of the public.

We have more than once had occasion to call the attention of the Admiralty and ship-owners to the auxiliary rudders invented by Mr. W. R. Malley, of Plymouth. These rudders are placed under the water-line, and consequently secure from shot. When not used they fit into a recess in ship's side, and therefore avoid offering any resistance to the ship's progress, the outer side of the rudder being on a perfect level with the ship's planking. A trial of the rudders has recently taken place in Plymouth Sound, on board of a small paddle-wheel steamer, to which one of the rudders was fixed for temporary purposes. Several naval officers were present to witness the trial, the result of which proved that the rudders are quite able to steer a ship, provided the main rudder should become disabled. The inventor considers that he should be enabled to turn a vessel, with the assistance of his rudders, in about half the time that is now consumed for that purpose.

On Friday last a trial of Mr. Wm. Roberts' fire-engine took place at Hodge's Distillery, Lambeth, in the presence of several scientific gentlemen and others. Upon 150 of pressure being obtained, the engine was propelled into the middle of the yard, and turned around a little over its own length in three seconds. Mr. Hodges and Mr Roberts then mounted the engine, and took it out of the yard and down Church-street, as far as the Railway arch, and brought it back again into the yard in three minutes. The engine was then taken to the water and worked, and a one and three-eighths jet of water was thrown 140 feet perpendicularly, and 184 feet horizontally, with a stiff breeze blowing at the time. Several other experiments were made with various size jets, showing that the engine could be used from its maximum quantity to about one gallon per hour. The result of the trial was satisfactory.

It can now be calculated with tolerable certainty that the International Exhibition will not pay. No doubt there are many causes for this. One is the many blunders of the Commissioners in the first place, what shook confidence in so many minds. Another, and no doubt a greater cause, is the distressed condition of the country. It appears that the large attendance during September 1851 will not be paralleled this year. The Exhibition will remain open throughout October, and be formally closed on 1st of November. At that time it is supposed the deficiency will amount to about £25,000. It appears that about £400,000 have been taken up to the present time. The guarantors, who came forth so liberally in the first place, need not, however, be under any apprehension, as Messrs. Kelk and Lucas, the contractors, have expressed their willingness to make an arrangement which will relieve the guarantors of any loss.

Our railway traffic is ever on the increase. As the weekly returns are made, we find that there is a very considerable difference in the amount of traffic over the corresponding period of the past year. And especially has it been so during the present season of 1862, when the International Exhibition has brought daily to the great metropolis its thousands. Last year, an average day's work of the railways of the United Kingdom was to carry 500,000 passengers, 258,000 tons of minerals and merchandise, 35,000 live stock, 1,100 dogs, and 740 horses. But during the present year, although it is not possible to give the exact number, in consequence of the companies keeping no record of the journeys of season-ticket holders, yet it may be fairly stated at six times the population of the whole of the United Kingdom. The trains (including the goods trains) travelled 2,897,748 miles more in 1861 than in 1860, which is equivalent to going round the world 116 times more last year than in the year before; but we shall doubtless find, when the time for the preparation of statistics for the present year shall have arrived, that even this number will pale before the increase of 1862. We are told, even, that nearly four million trains ran in the course of the last year, which would make an equivalent in a day of more than seven times the number of minutes in one day. Some idea also of the enormous amount raised by railway companies, as gross receipts, may be gained from the fact that the sum for the past year considerably exceed the interest of the National Debt, and amounted to about 8 per cent. on the capital. As the amount of traffic increases, so unfortunately, with few exceptions, does the number of accidental deaths and injuries. Thus while in 1860 the number was 509, in 1861 it increased to 827; but there was an exception in the years 1858-9, when the corresponding returns showed a decrease of about sixty. These returns, however, only apply to the passengers who met with their deaths or accidents from causes beyond their own control. Last year the sum of £131,062 was paid as compensation for personal injury. It must, however, be remembered that very serious and lamentable accidents on the Brighton and other lines would make this number considerably higher than the year previously.

A very interesting steam-plough trial took place on Saturday last in a field of 35 acres, on the farm of Mr. Collinson Hall, of Navestock, Essex, in order to test a new rope, or properly speaking, a chain, of a new construction, lately invented by Mr. Hall. A very powerful engine, built on Mr. Charton's principle, was used on the occasion. The steam was maintained at a pressure of 150-lbs. (the boiler being capable of standing a pressure of 360-lbs. per square inch.) The plough used was one of Fowler's ordinary four shares and the width of the field was about 160 yards. The winding drnm of the apparatus, which is made to correspond with the form of the chain, was mounted, as usual, beneath the engine. The drum consists of iron segments, each segment having two sides, one being longer than the other. The chain or rope is made out of a series of bars, with an eye at each end; to these eyes short links are attached by rivets. The space in the links between the ends of the bars is occupied by a tongue when travelling round the drum. By the use of the tongue a powerful grip is given to the rope, to enable it to propel the implement. Many advantages are obtained by this invention. It does not require the rope to be wound once or more round the drum to get a purchase, as in the case when a wire rope is used. Another advantage is that the giving off and taking on the rope is in the same line, and can therefore be brought into a position so as to keep the rope parallel with the ground, and so securing a direct pull upon the implement. The work performed at the trial gave great satisfaction, and we expect ere long to see Mr. Hall's improvement applied to all steam tilling operations.

OUR NAVAL ARTILLERY.

SOME important and interesting experiments were conducted on Tuesday at Shoeburyness, in the presence of the Lords of the Admiralty, and the members of the Plate and Ordnance Select Committee, with the celebrated monster gun made in the year 1855 by the Mersey Steel and Iron Company. The calibre of this gun is thirteen inches, and its weight about twenty-two tons. The solid spherical shot weighs 286 lbs. and the powder charge em-

ployed on this occasion 74 lbs. The "Warrior" target, against which the practice was carried on, was a mass 12 ft. by 10 ft., of 4½-in. armour plates, bolted to 18 inches of solid teak, in beams of 9 in. thick, laid transversely. One shot only was fired, which made, at the distance of 200 yards, a clean hole two feet square, right through the armour plates, wood backing, supporting ribs, and buried itself in the heavy timber supports of the target. The ascertained velocity of the projectile was 1,630 feet per second. The effect upon the target was so prodigious that no question can be entertained that even at a thousand yards the side of the "Warrior" would be penetrated with perfect facility. The next experiment proceeded with, was a test of Mr. Whitworth's 12-pounder breech-loading gun, at iron plates two inches thick, with solid steel projectiles, and hollow steel projectiles, filled with powder, but without fuze of any kind. The object of the experiment was to determine whether the result of the impact of a flat-ended steel projectile upon an iron plate at a short range would not evolve sufficient heat in the metal of the projectile itself as to ensure the ignition of the powder within the shell, after having passed through the iron plate. The gun was placed at a distance of one hundred yards from the target, and the solid projectiles having penetrated the two inches and two inches and a-half of iron, the shells were next tried, with a charge of one pound fourteen ounces of powder: the projectile itself holds six ounces of powder. The second shell burst, after passing through the iron and timber, slightly shattering the timber balk supports, but proving the question of the generation of heat in a sufficient quantity to ignite gunpowder, as had been previously determined in 1854, by the Ordnance Select Committee at Woolwich, when testing Mr. Lancaster's wrought-iron shell, at masses of granite.

Mr. Whitworth's 70-pounder was next tried. The target was constructed of one armour plate four inches thick, bolted upon an oak frame nine inches thick, attached by a side framing to a back of oak four inches thick, covered on the back by a plate of iron two inches thick; the interval between the front and back frame was about thirty inches, the target being intended to represent the side of a ship. The shell weighed nearly 70 lb., and the charge of powder employed was 12 lb. The gun was placed at 200 yards from the target. The first shell fired passed clean through the four-inch plate, as well as the timber backing, striking violently against the two-inch plate in the rear, which it bulged out and cracked nearly four inches, and then burst, shattering the timber box to pieces. Had it not been for the two-inch plate in the rear, the bursting would have taken place outside the target, after passing through, and therefore without material damage to the side of a vessel constructed with plates four inches thick.

Very different, indeed, must be considered the effects of the wonderful Horsfall gun. Where that struck, everything was driven resistlessly before it. The effect of the 70-pounder Whitworth on the iron plates was a hole about four inches in diameter, punched clean out, without any fracture of the surrounding portions of the iron. Where the projectiles from the Horsfall gun struck the iron, not only was a huge hole two feet square struck out of the mass of the plate, but the surrounding iron cracked and riven in all directions—a complete wreck in fact. This gun has opened up a new era in the construction of ships, and the arrangement of our defences.

From time to time our columns have been devoted to the discussion of this most important and interesting subject. Step by step we have examined and discussed the great Armstrong experiments, and we felt it our duty to express our unhesitating opinion of the unsoundness of Sir William Armstrong's propositions, and, as our readers are fully aware, entered at very considerable length into the reasons upon which our judgment was founded.

Day by day we find our opinion verified and sustained; and it will be observed, from the above results of the trials at Shoeburyness, that the Horsfall gun successfully accomplished that which Sir William Armstrong, with the whole resources of the nation at his command, has been, after numberless trials, unable to accomplish. And yet this gun has been in the hands of our government for six years, and all trials steadily and pertinaciously refused until it could no longer be denied. Where is the influence, of what nature, and why exerted, that should so compel the War Department into one particular channel? We fear very much that this will never be known until the real parties to the great Elswick monopoly are known to the country. One thing is clear, the results of these trials cannot fail to urge the Government to a more honorable course of action towards those gentlemen who have devoted for so many years their time, talents, and energy to the service of the country; and we doubt not that even the official mind will have to admit that the officers of the War Department have perpetrated a serious error of judgment in making an unwise contract, and spending three millions of public money uselessly.

SUBSTITUTES FOR COTTON.

It has been again and again stated that the American war will bring one blessing in its train—that of directing the attention of England to other fields for her cotton supply. New companies have been started for the purpose of promoting the growth of cotton in India, Jamaica, and Africa; and other companies are likely to be established for producing the article in Algeria, in Turkey, and other places. In fact, there is scarcely a warm part of the world where cotton may not be obtained in abundance. A correspondent states that cotton grows spontaneously in Cochin-China, and that it is in the power of France to obtain from that region sufficient of the commodity to render her independent of foreign supply. It appears that the growth of the cotton is not confined to merely one province, but that the entire country is suited to its production. The cotton grown in Cochin-China is said to be soft and silky; and, though but little attention has hitherto been devoted to its cultivation, it rivals in quality the produce of New Orleans. After a two years' war, Cochin-China has alone exported 2,000,000 lbs. weight of cotton.

It is not, however, in finding new regions for the production of cotton which excites curiosity, but in finding substitutes for that material. On Monday last a letter appeared in the "Morning Star" from Mr. F. Fenton, Mappleton, Derbyshire, calling attention to the writer's process for converting jute, rhea-fibre, hemp, flax, tow, China grass, &c., into a substance capable of substituting cotton, and of being spun by the same machinery. The writer of the letter enclosed a sample made from Russian hemp. He says: "From flax, or China grass, a fibre-cotton of the greatest strength and fineness is produced, and I may add that the cost of conversion is merely nominal and very rapid, and requires little machinery, and that of the simplest kind."

On the following day the "Star" offered some comments on the sample of fibre-cotton enclosed by Mr. Fenton. It says:—"It is, in appearance, about as much like cotton as sawdust is like wheat flour. It is in colour rather brown than white. It is rough, hard, and brittle. Its fibres are thin but short. It has no soft down clothing and intertwining with its threads. It is, in fact, a woody rather than a woolly substance. The process to which it has been subjected has no doubt effected a considerable change. Neither rhea, nor hemp, nor jute, nor China grass could have been made to yield such a material by any of the arts known to our chemists or manufacturers. Flax cannot be beaten into fibres thus fine, nor steeped in any liquid with which we are acquainted until thus intermixed. Mr. Fenton is certainly in possession of a secret which it must have cost much ingenuity to discover; and if cotton had disappeared from the earth his secret might be as valuable as it is curious. We have no doubt that the yarn which has been spun from the material of which he has sent us a sample has its uses. It may compete with flax. It may be wrought up into a coarser and stronger sort of linen. It may serve to mix with wool or silk in the various fabrics in which those substances enter. But it is too unlike cotton to be used as a substitute for it in machinery which cannot easily be re-adapted to unusual descriptions of that article."

It is so far encouraging to know that if the war in America continues to desolate that continent, and if other parts of the world cannot be rendered so prolific of cotton as they have so frequently been represented, substitutes may be obtained to answer some of the purposes of that article.

But this is not the only substitute for cotton which has recently occupied the attention of many most interested in the question. Some letters have been just published by Messrs. Phillips and Son, of Abchurch-lane, which go to show that another discovery or invention has been made; and the inventor himself steps forward and says that he firmly believes that he shall be able to establish—1. That his substitute will answer all the purposes of cotton; 2. That a present and sufficient supply can be procured and the operatives at once set to work; 3. That the future supply of the material may be obtained by cultivation in the United Kingdom, without displacing one acre of land from other purposes; and thus be the means of developing a new staple industry for the country. This appears almost too good to be true. But the writer is most unreserved in the matter, which a committee has been formed to investigate. It is said that manufacturers, and other gentlemen capable of judging, have passed a very favourable opinion on the material, and that many persons practically interested in the cotton question have visited the counting house of Messrs. Robertson and Fleming to see "the patent prepared jute," and have admitted that it is well adapted for use, and that by being made with the fibre or staple shorter, it can be readily mixed and spun in the cotton machinery. There appears to be no difference of opinion on the adaptability of the material being mixed with wool. We shall watch with some interest this investigation.

We find from an article in the "Nord" that a French captain has just returned from Africa with specimens of a plant, the name of which he keeps a secret, and which, when subjected to some chemical process, yields a substance perfectly resembling cotton. Several specimens have been woven from this material and presented to the Emperor of the French. It

is said that these stuffs are stronger than cotton tissues, equal in fineness, and 60 per cent. cheaper. The plant abounds in Africa and America. A company is being formed to produce this substance. This is only a newspaper report, and should be accepted with considerable caution. There is, however, considerable satisfaction in knowing that endeavours are being made in many directions to open up new fields for the cultivation of cotton, or to produce substances which will answer, to some extent, its purposes.

BREAD-MAKING BY MACHINERY.

THE question of making bread by machinery is now attracting attention, and well it should, considering the importance of the subject. There can be no doubt that many of the bakeries of the metropolis are in a scandalous condition. Mr. Tremenheere, in his report on the subject, recently published, says, "In about "half the total number of the bakehouses "visited by me I found not only the ventilation "very defective, but the state of dirt beyond "what I had been led to expect." Though Mr. Tremenheere's report has been, in some of its features, contradicted by some correspondents, it has been substantially confirmed by others. One correspondent who signs himself "Home-Made," says, "Some years since I "lodged with a baker (not in London), and "was so thoroughly set against bakers' bread, "that I seldom ate a mouthful, and when I do "it is under exceptional circumstances, and as "sparingly as possible. I have seen cock-"roaches and crickets in swarms crowding the "kneading-trough; and one morning, hap-"pening to pass through when the men were "making the dough into loaves, I saw the "knife of one cut through two mice in the "space of three or four minutes, and cock-"roaches were pretty thick. The man told "me it was of nightly occurrence, and that "neither cats nor mice were of much use in a "baker's shop." These, however, are not the only sources of dirt in a baker's shop. Some correspondents speak of sweat, of sore arms, and many other disagreeables. We must make our allowance for exaggerations in this as in most other questions. No doubt it is supposed to be to the interest of inventors of bread-making machines, if not to misrepresent matters, at all events to magnify the objectionable features of the present system of baking. But Mr. Tremenheere is above suspicion, and what he has reported is sufficient to arouse public attention on the subject.

Now that we have machinery applied to washing, cleaning knives, boots, and other domestic necessities, it is a little surprising that machinery has not been more successfully applied to bread-making. We have heard a great deal about the over-worked and oppressed journeyman baker, his pale face, and the stern necessity he labours under to turn night into day; and when the vast amount of bread daily made in the metropolis is considered, it becomes a legitimate subject of enquiry why manual labour has not been more extensively superseded by machine work. One patented invention—that of Mr. Stevens—has been advertised and paraded before the public to a considerable extent, and a company has been formed to promote its manufacture and use; but, either from its inefficiency or dearness, it is certainly not much used by bakers. It has been recommended, testimonialized, and patronized, but the trade do not manifest any particular partiality for it. One correspondent who approves of the machine says, "The pe-"cuniary position of bakers generally renders "them unable to bear the expense of putting "up a machine, which, to be complete, costs "nearly £100." Another correspondent, "A "Journeyman Baker," denies that the machine is any saving of labour—"that whilst there "were four doughs made every night, only "one was made by the machine, the other "three being made in the usual way; and so "hard did the men find the work that they "would have been glad not to have used the "machine at all; but, as the bread was adver-"tised as machine-made, master insisted on "some being made in that way." The publication of this letter brings the "master" into print, but as he acknowledges that he has become a director of the company formed for manufacturing and selling Stevens' machine, we must be a little cautious in receiving his testimony. But whether Mr. Stevens' machine be efficient or not, or whether it is superior to that invented by Mr. Vickers, we shall not stop to enquire, but it is quite evident that neither machine is very much used. We have always considered that the price of bread-making machines, and particularly that of Mr. Stevens, stood in the way of their general adoption.

This, then, is an important question for inventors and manufacturers. We see no reason why mechanism cannot be applied to bread-making as to washing clothes. There is no necessity for intricate machinery. The operations involved in bread-making are simple, and can easily be performed; and it is not very creditable to the scientific mind of the age that some cheaper and more efficient method of making the staff of life has not been adopted. It is not only an economical question, but a sanitary and philanthropic one, and we shall continue to agitate it until it is put on a more satisfactory basis.

M. FREMY ON THE PRODUCTION OF STEEL.

AT the sitting of the French Academy of Sciences, held on the 18th August last, a paper was presented on this subject by M. E. Fremy, already well known by his researches on the composition of steel. The following is an abstract of the paper:—

The author commences by observing that steel is destined to play a far more important part in industry than hitherto. It is already employed for rails, axles, tyres, piston-rods, and shafting; the military are thinking of producing cast steel guns, and men-of-war will soon replace their heavy iron plating by a light, elastic, and tough plating of steel. It is evident that those nations who do not strive to keep up with the march of science will very soon be left in a position of inferiority.

France possesses abundance of iron ores of good quality, but fuel is dear and transport still costly; hence the metallurgical methods to be sought for must be such as will reduce the cost of fuel to a minimum, so that good French ores shall form the principal article of expenditure.

The author goes on to enumerate the distinctive qualities of cast iron, malleable iron, and steel, remarking that steel has the good properties of the two other varieties without their objectionable features. It also possesses the power of resisting a crushing force in a greater degree than that we find in cast iron, and double that which is found in malleable iron. It also receives homogeneity by fusion. Hence, cast steel is the best material for any new applications of iron, and the question to solve is, how it shall be obtained in masses of considerable size. The Yorkshire method gives excellent steel; but in this proceeding it has hitherto been only found practicable to fuse it in crucibles holding not more than twenty kilogrammes (forty-four lb.) of steel. Reverberatory furnaces have so far given no results on an important scale. Again, this method requires malleable iron specially adapted for the purpose, and very costly; and, in addition, a large quantity of fuel, equal to six or seven times the weight of the steel obtained. On this system, therefore, France could not successfully compete with England, for to her economy of fuel is of the greatest importance. The author had endeavoured to work with this in view, in order to discover a process in which fuel shall be little required. When he commenced his investigations, it was generally thought that, in order to get good steel, we must go to Sweden or Russia for the proper quality of iron; and it was also considered that the iron must obtain from its ore a sort of steeling propensity. The author had never doubted the importance of this propensity, which is possessed by the iron of the north, but he desired by chemical examination to clear up what was a metallurgical mystery, and to determine the nature of the body which is the real agent in the conversion of iron into steel. Lastly, he wished to find a means by which iron hitherto rejected could be made to furnish steel. He, therefore, went carefully into the subject, with the view of ascertaining the exact composition of steel. It resulted, from his investigations, that carbon was found to be not the only useful element in the conversion, but that other metalloids, as phosphorus and nitrogen, play an important part. He also established the fact that these bodies cannot act properly unless they are present in proper proportions, and unless there is an absence in the iron of any body, such as sulphur, which would paralyse their action. The quality of the northern iron depends on the presence of the particular elements which he had found to be necessary, and cementation completes the number, provided noxious substances are absent. Hence, in order to make steel, it is necessary, by careful refining, to eliminate from the iron the noxious ingredients, and to impart to it those which are wanting. If we use an impure iron, or if we add an insufficient quantity of any necessary element, such as carbon, we are certain to fail.

The author states that he has completely succeeded in his object, and he expresses his obligations to Mr. W. Jackson, the director of the works of Saint Seurin, who placed the resources of his establishment at the disposal of M. Fremy, who was thereby enabled to conduct experiments impossible in a laboratory. While in England he had an opportunity of seeing Bessemer's process once, along with Mr. Brown, his colleague on the jury. Although much struck with the magnificence of the process, it left serious doubts on his mind as to the quality of the steel produced. His colleagues on the English jury maintained that the Bessemer steel tempered irregularly, and could not be compared with ordinary cast steel. He left England with the impression that the cast iron of France, reduced by coke, would contain too much sulphur and phosphorus to be treated by this process; but all his fears were dissipated by his experiments at Saint Seurin. The Bessemer process in twenty or thirty minutes converts cast iron into a kind of burnt or azotised malleable iron, excessively *red-short*. In this condition it cannot be used, but the addition of a small quantity of cast iron, suitably chosen, and which contains the steeling principles, produces steel immediately. Hence, the Bessemer steel is the result of the combination of azotised malleable iron (fused) with a small quantity of cast iron possessing the necessary properties. The malleable iron varies in character with the cast iron from which it is produced. Experiments were made on a large scale, using twenty kilogrammes of material at once, so as to give confidence in the results obtained. It was found, that all iron which can be conveniently refined will give excellent steel when submitted to the requisite conditions.

Their first trials gave steel which would not resist tension. Synthetical experiments led them to improve their means of purification, and to make use of more active means for imparting the steeling properties. The result was that they got excellent steel from French pigs, until now considered incapable of conversion. Several thousand kilogrammes of steel had been thus

obtained. It can be hardened by tempering, and has already been made into various articles, as lathe tools, gravers, knife blades, &c. English workmen who examined the specimens considered them equal to good English steel.

They had thus produced, in twenty-five minutes, with French pig, costing about ten francs the 100 kilogrammes, a cast steel worth 150 francs the 100 kilogrammes; and they had converted into excellent steel varieties of cast iron hitherto not treated by Bessemer's process. Lastly, they had succeeded in obtaining complete fusion of malleable iron, which, therefore, became much more tenacious and also more homogeneous. It could thus be applied to fresh uses.

The author excuses himself for not going further into details, as he could not do so without revealing what he had only learnt in confidence. He observes, however, that in following out the process strict chemical examination of the cast iron is necessary. Each variety requires a special study, in order to ascertain what ingredients it possesses, and in what it is deficient. Chemical analysis is, therefore, the only true guide. He concludes by anticipating a great revolution in the metallurgy of iron from the facts here indicated, and it will be one which will place France in a more advantageous position than heretofore.

IMPROVED FLUSHING APPARATUS.

FIG. 1

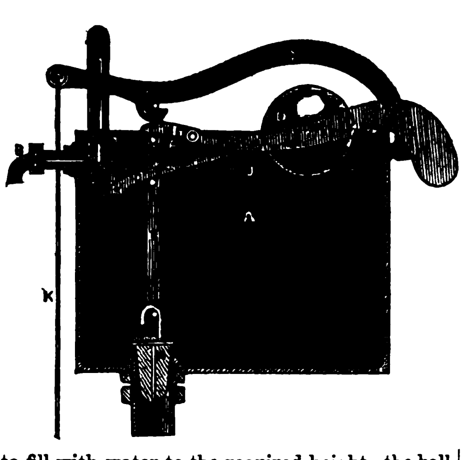
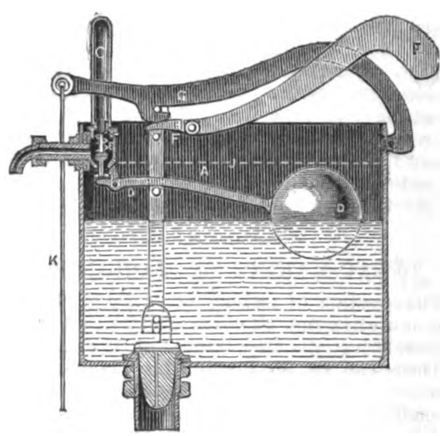


FIG. 2



Mr. G. Manwaring, of Southampton, has just patented an apparatus for flushing closets, sewers, and other services, which he describes as follows:

My invention consists of self-acting mechanical appliances, whereby the closet is cleansed after the same has been used, by means of supplying water through a cistern connected to and working with a small supply cock or inlet valve, to which I apply an air vessel, by which means the supply valve can be worked against any pressure with ease and soft action; the large outlet or discharge valve from which is closed, while the inlet valve is opened, and *vice versa*.

The following is a description of one of the methods I adopt in carrying out my invention:—Water is admitted into a cistern through a supply cock or valve fitted to the upper part of the cistern, to which I attach an internal loaded floating ball, which gives power to the ball lever, sufficient to open the valve against any pressure. This connecting lever to the valve is regulated by a connecting rod having adjusting stops and pins in it, which causes a proper pause of time in the action in the opening and shutting of the supply and discharge valves, causing them to be worked with the greatest accuracy; the lower end of this connecting rod is jointed to the discharge valve; in the middle of the rod the lever of the floating ball works, and the upper end of this rod is jointed to the working lever, which takes its fulcrum from the end of the cistern at that part of this lever where it is attached to the connecting rod; the under part of the joint is acted upon by a lifting arm on the weigh or weighted shaft, which is provided with guides for the connecting rod; the lifting arm raises the working lever, and the connecting rod, by means of the counterweight, after the same has been kept down by the closet being occupied, during which time the cistern is filling with water; by this motion it cases the supply valve to close and the discharge valve to open.

The particular formation of the moving joints or bearings which I apply avoids the necessity of bolts, screws, or joint pins, rendering the general application simple, cheap, and durable, and the supply cistern cannot be affected by the frost, it being only charged during the time the closet is occupied.

When the apparatus is applied to work self-acting, it is thus the closet seat may be hung on pivots or hinges, or othewise, competent to allow the same to decline about three-quarters of an inch. When the closet is occupied by a person, it is thus kept down:—The connecting chain or wire from the seat presses the end of the working lever down, which closes the discharge valve and opens the supply valve, and allows the cistern to fill with water to the required height; the ball then floats, which causes the supply valve to shut; all then remains stationary until the person leaves the closet seat, which then rises again to its original height by means of the spring or weighted lever, and the counterweigh or weighted shaft then raises the working lever and the connecting rod which opens the discharge valve, and the supply of water in the cistern descends through the down pipe to the pan of the closet, which flushes the soil away to the sewers.

My invention may also be applied without being made to work self-acting, that is to say, the chain or wire from the working lever may be worked by hand, then the mechanical appliances in the cistern will work the same as before mentioned.

My invention will be found especially adapted to high-pressure, as all waste of water will be effectually prevented and no leakage is likely to occur; it may also be applied with low pressure; the size of the cistern may be varied to suit circumstances; I find, however, that one of the capacity of about one and a-half gallons is sufficient to supply an ordinary water-closet. In the drawings hereto annexed I have represented a cistern constructed and fitted with the mechanical arrangements according to my invention.

Figure 1 is a section, showing the cistern empty and the fittings in their respective positions, the supply valve being closed and the discharge valve open; Figure 2, a similar view, representing the cistern filling with water and the fittings in their respective positions, the supply valve being open and the discharge valve closed. Similar letters of reference indicate similar parts in both figures.

A is the cistern; B B the inlet or water supply valve to the cistern; C the air vessel for the supply valve; D D the loaded floating ball and lever; E the connecting rod which regulates the working of the ball lever; the rod at the top end is attached to the working lever G, and the lower end to the discharge valve H, for the purpose of opening and shutting the same; F F F the weigh or weighted shaft, the working arm or lever of which passes through the connecting rod E, near the top part thereof, for the purpose of guiding the rod E, and working against the under part of the joint of the working lever G; G G G the working lever, the fulcrum of which vibrates in a hole at the end part of the cistern; H the discharge valve; I I the brass seat of the discharge valve, with union joint to connect the discharge pipe; J J the water line of the cistern when full; K the connecting chain or wire from the lever to the closet seat, or from the lever for hand-pull.

STEAM-BOILER EXPLOSIONS.

The Decomposed Steam Hypothesis—The unsatisfactory results generally obtained by those who have sought to decompose water by heat on a large scale, with the view of applying its elementary gases separately, does not appear to have prevented the occasional adoption of the hypothesis that, in certain cases, all the steam contained within a boiler is decomposed, and its hydrogen (by some means not easily explained) exploded with great violence. That steam, passed over pure metallic iron heated to redness, is decomposed, is perfectly true, although the iron must retain all the oxygen separated in the operation. With oxidised iron, however, the process of decomposition cannot be continued. This is, we believe, a chemical fact of which there can be no dispute. To decompose 1 lb. of water (or steam, which is chemically the same substance) 14·2 oz. of oxygen must be fixed by the iron, and only 1·8 oz. of hydrogen will be set free. This large proportion of oxygen, absorbed by only a few square feet of over-heated surfaces, would soon form an oxide of iron of sufficient thickness to arrest all further decomposition, and all the hydrogen up to that time disengaged would not amount, perhaps, to 1 lb. in weight. By itself, or mixed with steam, hydrogen cannot be exploded, nor even ignited. It will extinguish flame as effectually as would water.

Upon this subject we may refer to a report made by Professor Faraday, in May, 1859, to the Board of Trade, upon the liability to accident consequent upon the introduction of an apparatus for superheating steam on board the Woolwich steamboats. In this apparatus the steam was carried in iron pipes immediately through the furnace, and in contact with the incandescent fuel. Professor Faraday, after having examined the apparatus at work, says:—

"I am of opinion that all is safe, *i.e.*, that, as respects the decomposition of the steam by the heated iron of the tube, and the separation of hydrogen, no new danger is incurred. Under extreme circumstances the hydrogen which could be evolved would be very small in quantity—would not exert greater expansive force than the steam—would not with steam form an explosive mixture—would not be able to burn with explosion, and probably not at all, if it, with the steam, escaped through an aperture into the air, or even into the fire-place.

"Supposing the tubes were frequently heated over-much, a slow oxidation of the iron might continue to go on within; this would be accompanied by a more rapid oxidation of the exterior iron surface, and the two causes would combine to the gradual injury of the tube. But that would be an effect coming under the cognizance of the engineer, and would require repair in the ordinary manner. I do not consider even this action likely to occur in any serious degree. I examined a tube, which had been used many months, which did not show the effect; and no harm or danger to the public could happen from such a cause."

Professor Taylor, of Guy's Hospital, reported in part, as follows, upon the same apparatus:—

"It is true that steam passed over pure metallic iron heated to redness (1,000 deg.) is so decomposed that the oxygen is fixed by the iron while hydrogen gas is liberated. This chemical action, however, is of a very limited kind. The surface

of the iron is rapidly covered with a fixed and impermeable layer of the magnetic oxide of iron, and thenceforth the chemical action is completely arrested. If the interior of an iron pipe has been already oxidised, by passing through it, while in a heated state, a current of air, there will be no decomposition of steam during its passage through it. If the interior of an iron pipe were not thus previously oxidised, it would speedily become so by the oxygen derived from the air, which is always mixed with steam. Hence, chemically speaking, under no circumstances, in my opinion, would any danger attend the process of superheating steam as it is conducted under this patent. It is proper, also, to state that hydrogen is not explosive, but simply combustible, and, assuming that it was liberated as a result of the decomposition of superheated steam, its property of combustibility would not be manifested in the midst of the enormous quantity of aqueous vapour liberated with it and condensed around it. There could be no explosion, inasmuch as hydrogen, unless previously mixed with oxygen, does not explode; and oxygen is not liberated but actually fixed by the iron in this process. It is a demonstrable fact that the vapour and gas evolved under the form of superheated steam tend to extinguish flame and to prevent combustion from any other cause."

Professor Brande, in a report made by him to the patentees of the same apparatus, observes:—

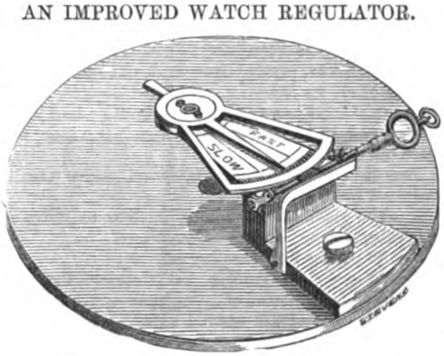
"In reference to the question which you have submitted to me, respecting the possible or probable evolution of hydrogen gas, and consequent risk of explosion in the processes, and by means of the apparatus which you employ for the production of superheated steam, I am of opinion that there can be no danger from such effect—that the temperature to which the iron pipes connected with your boiler are raised, and the extent of the iron surface over which the steam passes, are insufficient for its decomposition; and that, if the temperature of the pipes were even raised considerably beyond that which you employ, or would be able to attain, a superficial layer of oxide of iron would line the interior of the heated pipes, and so prevent any continuous decomposition of water. Effectually to decompose steam, by passing it over iron, it is necessary that a very extended surface of the metal (as in the form of thin plates or iron turnings) should be used, and that the temperature should be continuously maintained at a bright red heat, namely, at a temperature considerably above 1,000 deg. F. I have read Dr. Taylor's report, and entirely agree with the inferences he has drawn as to the absence of danger from the evolution of hydrogen gas in practically carrying out your process for the production and application of superheated steam."

The practical conclusions upon this subject are the following:—1. Decomposition cannot possibly occur, to any considerable extent, under any circumstances arising in the working of ordinary steam boilers. 2. If it did occur, the hydrogen thus liberated would have no access to oxygen, without which it could neither inflame nor explode. 3. Even if oxygen were present, the presence of steam would prevent ignition. 4. If oxygen were present, and no steam existed in the boiler, the hydrogen would only inflame and burn silently as fast as it was produced, the heat for ignition being supposed to come from a red-hot plate. Under these accumulated impossibilities of violent explosive action, the explanation of boiler explosions by the decomposition of steam is without any support whatever.—*Chemical News.*

GARDENS ON HOUSE-TOPS.

AN Edinburgh paper says:—"In a tall block of building in the Pleasance, Edinburgh, a curious and novel arrangement—that of converting the roof of the house into a bleaching-green—has been carried out. In the roof, which is of course flat, the first requirement is, that it should be water-tight. To secure this, the sole is constructed of thick iron plates, rivetted together at the flanges, and having india rubber introduced in the manner of a 'washer' between the edges. To resist corrosion, the iron has been treated while in a heated state with oil, which it is expected will act as a preservative of the metal. Over the joints of the plates asphalt has been poured, so as to assist in preventing the access of damp to the house below. Next the iron a thin layer of clay is placed, above which soil is laid, making a thickness of twelve inches from the iron to the top of the turf. The 'green' is divided by walks of asphalt, so as to preserve the turf, and at the same time to give access to all parts of it. Round the sides the edges of the iron plates are turned up to the extent of 14 inches, so that continuous rain to that depth must fall before the water can run over the walls, supposing all drainage and evaporation to fail. At the front and back, a parapet of one foot in height, carrying an iron railing of five feet, will afford complete protection, the ends being protected by the chimney stacks. A portion of the roof is occupied with a large water cistern, composed of iron, double-cased, with sawdust between, to prevent the action of the sun and of frost from affecting the water. The staircase by which the roof is reached is covered with a tall hutch, on the outside of which a ladder and gangway afford access to the chimneys. Notwithstanding the quantity of iron used in the roof, the weight of the structure is comparatively light. The pressure is vertical instead of outward, as in a sloping roof, and the partition walls throughout carry their share of the weight. The plates have a bearing of 14 inches on the front and back walls, and are sunk four inches in the gables, thus giving abundant support on all sides. The idea of utilising the roof in this way is entirely new, and should the present experiment stand the test of time, the plan will probably be adopted in other cases."

AN IMPROVED WATCH REGULATOR.



THE above engraving illustrates an arrangement for moving the regulator of a watch or other time keeper by means of a key of the ordinary form. This arrangement is patented by Mr. N. Wighton, watchmaker of Edinburgh. A quadrant is attached by arms to the ordinary regulator hand, the outer edge of the quadrant is toothed and geared into by a worm on a spindle, which is acted on by the key, as shown. The regulator hand is caused to move to or fro, according to the direction in which the spindle is turned. A spring entering the teeth of a ratchet wheel on the spindle retains the regulator in the position at which it was set until the spindle is again turned.

The mechanical arrangements for fitting and fixing the armour plates of the "Prince Consort" at Pembroke dockyard are completed. These arrangements, which have been devised and carried out under the superintendence of Mr. J. Inman Fincham, the master shipwright of the yard, provide for an extremely economical system of work, and have been warmly commended by the Board of Admiralty. Tramways have been laid down from the landing wharf to the ship's sides, and to the machine-house, and steam cranes for raising and lowering the plates have been placed upon them on wheels, so that the huge plates, weighing several tons each, can be transported from the wharf either to their places on the side of the ship, or to the machine-house and back again in a very few minutes. The machine-house contains numerous well-selected machines for bending, planing and drilling the plates, and furnaces for annealing them when necessary.

ON THE CHEMICAL EXAMINATION OF IRON SAMPLES, AND OF THE MATERIALS EMPLOYED IN THEIR MANUFACTURE.*

By F. A. ABEL, Esq.,
Chemist of the War Department.

IN conducting a large series of analytical examinations of a quantitative character, which have been undertaken, not simply to furnish results of scientific interest, but with a view to be of use in considerations of a practical character, it is not only admissable but necessary that some discrimination should be exercised in determining the extent of detail of such examinations, so that, on the one hand, a proper knowledge be obtained of the proportions of all the important and characteristic components of a substance, while, on the other hand, no great unnecessary expenditure of time and labour be incurred in researches on the existence or proportions of constituents which occur in minute quantities in the substances examined, and have not yet been discovered to exert any influence on its chemical or physical character.

Thus, the existence in cast iron of metals, such as titanium, calcium, magnesium, nickel, copper, lead, &c., has been traced by minute analyses of various samples by different chemical authorities, and the proportions in which they occur have also frequently been determined; but it is only when some foreign metal, such as copper, lead, or arsenic, has been found to exist in a sample of cast iron in a larger proportion than usual, that it has been proved to exert some marked and well-established influence over the character of the metal.

It may, therefore, be safely inferred, in the present state of our knowledge, that modifications in the properties of cast iron are not dependent upon the presence or absence of minute proportions of such foreign metals, and that researches having in view the discovery or the determination of the proportions of these constituents, do not at present possess any practical interest, and are only advisable:

1. In conducting analyses of specimens of peculiar interest for purposes of scientific record.
2. In undertaking special researches with a view to ascertain whether, and to what extent, these constituents influence the properties of cast iron.

Such researches as those last referred to are unquestionably of great interest, and, if pursued to a sufficient extent, may possibly lead hereafter to important practical results. Their objects differ, however, from those of the investigation, the results of which are embodied in this report, and which was undertaken with a view to ascertain, by an application of our present knowledge of the chemical and physical properties of cast iron, the relative qualities of various descriptions of pig iron submitted by numerous manufacturers.

There is no question, however, that it is in most instances very important to perform complete analyses of materials which are to be employed for the extraction of metals; for as these, at the high temperature necessary in the process of their reduction from ores, are endowed with powerful affinities for many of the frequent constituents of such ores, their properties will suffer more or less important modification by union with some of these components in the course of their reduction.

The quality of the product may therefore be, to some extent (when the treatment is under control), predicted from the results of a complete examination of the materials employed. It is, consequently, not only essential to ascertain the general composition of an ore, for the purpose of determining the nature and proportions of the auxiliary materials (fluxes) to be associated with it in the reduction process, but it is also of considerable importance to ascertain whether, and in what proportions, such constituents (as foreign metals, sulphur, and phosphorus) are contained in the ores, as are likely to enter into

* Report of Experiments on British Irons, Ores, &c., for the Manufacture of Cast Iron Ordnance.

the composition of the product, and exert an influence upon its properties.

In the chemical examination of the large series of iron samples, and materials employed in their manufacture, the system of analysis adopted has been based upon the principles embodied in the foregoing remarks.

The analyses have been performed by Mr. John Spiller, formerly chemical assistant at the Royal College of Chemistry, and subsequently at the Government School of Mines; and Mr. Arthur Reynolds, late an assistant at the College of Chemistry.

The samples of ores received from the manufacturers have been all submitted to complete analysis, excepting in the following instances:—

1. In one or two cases where the samples were found to be identical in character with some of the series of ores recently submitted to complete analysis at the Government School of Mines, under Dr. Percy, the results of which have been published in the "Memoirs of the Geological Survey of Great Britain."

The close resemblance of the samples to those above alluded to was established by a comparison with the descriptions given of the ores in the Government Report, by a careful examination of them made by Mr. Spiller, who performed a large number of the analyses alluded to in that report while at the School of Mines, and was well acquainted with all the specimens examined; and lastly, by a determination of the most important constituents of the samples received (*i.e.*, the oxide of iron and phosphoric acid), and a comparison of the results with those of the published analyses.

In these instances, as a complete analysis of the samples would have involved a very considerable unnecessary expenditure of time, it was not undertaken; but the detailed analyses of the ores, to which the samples corresponded, have been extracted from the Government Report.

2. A few of the ores received had been submitted to the roasting process. As the effect of this treatment of an ore is greatly to modify its original composition, partially expelling certain constituents, and altering the arrangement and state of combination of others, a detailed analysis would afford no direct indication of the original nature of the ore. In such instances, therefore, it was only considered important to determine the per-centages of iron, and of those constituents which might affect the quality of the metal obtained from the ore—the phosphoric acid and sulphur.

3. The ores sent by some manufacturers were identical in their nature with those from other works, and of which complete analyses have been made. In these instances the most important constituents of the samples in question have alone been determined, references having been made, when needful, to the full analyses.

The minerals employed as fluxes were all submitted to complete analysis, except in one or two instances, when their identity with samples already analysed was established by the determination of one or two constituents.

The examination of the fuel was partial, the only important object being to determine to what extent it might contain mineral matters possibly prejudicial to the quality of the metal reduced by its means. The examinations, therefore, included determinations of the amount of sulphur in the coal or coke, and the amount and character of the ash furnished by incineration. It was also considered interesting to determine the amount of coke furnished by the different samples of coal.

The analyses of the samples of iron were, for the reasons already stated, limited in most instances to the determination of the proportions of those constituents which have already been satisfactorily proved to exert some influence on the quality of the pig iron, or on the results obtained by submitting it to subsequent processes of manufacture.

The constituents in question are manganese, silicon, phosphorus, sulphur, and carbon.

With reference to the last-named substance, it may be necessary to observe, that almost all the specimens of pig iron examined which are included in this report were varieties of grey iron, and that but very few of the samples contained any appreciable amount of carbon in the combined form.

It was, therefore, of no importance or interest to determine the minute portions of carbon existing in the samples in the latter form, and this was proved by special examinations of a few of the light grey samples of the series, in which the amount of combined carbon was not found to exceed at highest 0·35 per cent.; and also by the determination of the total amount of carbon in a sample of No. 1 pig iron, the result obtained being identical with that afforded by the direct estimation of the carbon existing as graphite.

In two or three instances it was considered interesting to examine specially for certain foreign metals which had been found to exist in appreciable quantities in some of the ores from which the samples thus examined had been obtained.

Description of the Analytical Processes employed in the Chemical Examination of the Irons, Ores, Fuels, and Fluxes.

I.—Analyses of the Iron Samples.

Preparation of the Sample.—Preparatory to its examination, the metal was reduced to a suitable state of division by boring, turning, or planing. In the case of white iron it was broken to a coarse powder in a steel crushing mortar. It was considered preferable to prepare an average sample of the pig by boring across it, so that a fair proportion of the graphite, which was occasionally concentrated towards the centre or the pig, might be included in the sample. The fine borings obtained in this way were further reduced when necessary, and thoroughly mixed by trituration in a Wedgewood mortar.

Chemical Analysis.—In the analysis of pig iron the proportion of the following constituents were usually determined: maganese, carbon, silicon, sulphur, phosphorus, and, in certain cases, metals such as arsenic, lead, and copper, when their existence in appreciable quantity had been discovered in the ores from which the iron had been obtained.

For this purpose four portions were usually weighed out:—

a. 100 grains for sulphur, carbon existing as graphite, silicon, and manganese.

b. 50 grains for phosphorus.

c. 50 to 100 grains for determining the existence and amount of combined carbon.

d. 500 grains for metals existing in the iron in minute proportions.

Sulphur.—100 grains of the iron borings were slowly dissolved in concentrated hydrochloric acid, the evolved gas being passed through a solution of acetate of lead, slightly acidified with acetic acid, the sulphuretted hydrogen, disengaged together with hydrogen, precipitated the sulphide of lead, which was collected on a filter, washed, burnt, and subsequently, in the customary manner, converted into sulphate of lead, from the weight of which the per-centage of sulphur was calculated.

The contents of the flask, after the metal had been fully acted upon, were transferred to a porcelain basin and evaporated to dryness, the mass digested with concentrated hydrochloric acid, and water afterwards added. The insoluble residue, consisting of silicic acid and graphite, was collected on a filter, the filtrate being reserved for the estimation of manganese.

Carbon as Graphite.—The mixed silicic acid and graphite were separated by the action of a warm solution of pure potassa, when the silicic acid was dissolved, the graphite which remained insoluble was again collected, washed with dilute hydrochloric acid and water, and dried. It was afterwards carefully removed from the paper by scraping with a knife blade, and transferred to a platinum crucible, in which, after exposure for some time to about 300 deg. F., it was weighed. Upon subsequently burning the graphite in a muffle, it usually left a very small quantity of reddish ash, which was deducted from the former weight.

Silicon.—The amount of silicic acid dissolved by the potassa was recovered in the usual manner, by evaporation with hydrochloric acid; the residue was digested with water, collected, washed, dried, and weighed. The amount of the silicon in the iron was calculated from the silicic acid obtained.

Manganese.—The hydrochloric acid solution, separated from the silicic acid and graphite, was divided into two equal portions, one of which, representing 50 grains of iron, was always sufficient for the estimation of the manganese. The iron in the liquid having been per-oxidised by boiling the hydrochloric acid solution, and adding occasionally a little chlorate of potassa, the acid was to a great extent neutralised by addition of carbonate of ammonia. Sufficient acetate of ammonia was afterwards added for the conversion of the chloride of iron into acetate, and the liquid was boiled, when the iron was completely separated as insoluble basic acetate. The filtrate containing the manganese was rendered alkaline with ammonia, and, after the addition of a few drops of bromine, set aside for about eighteen hours. The hydrated binoxide of manganese which had separated from the liquid, was afterwards collected, washed, dried, and ignited at a high temperature, when it was weighed as manganoso-manganic oxide (Mn_3O_4), which furnished, by calculation, the quantity of manganese.

ON THE CONFORMATION OF THE ALPS.

By Professor Tyndall, F.R.S. *

During the last seven summers I have had opportunities of viewing the Alps from many commanding points of view, and while in such positions have often speculated on the agencies which have given this portion of the earth's surface its remarkable conformation. How have the hills risen, or how have the valleys sunk? I think the mere inspection of the mountains from a sufficient elevation must suggest insuperable difficulties to the assumption that the present mountains have arisen through the action of forces localised beneath their bases, or that the valleys, as they now exist, can have sunk through want of local support underneath. Probably nobody entertains such a notion. Upheaval may have occurred, and sinking may have occurred; but it is next to inconceivable that either action should have been so parcelled out as to produce the present conformation of the Alps. A *general elevation* of the land must be assumed, producing a kind of lopsidedness as regards the figure of the earth; and the question then occurs, how has the land, thus elevated, been carved into its present form?

In the uplifting of the land, cracks and fissures would probably be produced, and the valleys migh be regarded as the traces of these cracks and fissures—widened and deepened, it may be, by subsequent denundation. But the direction of the valleys is not that in which cracks would take place. The valleys generally follow the line of steepest fall, and this would be the line of greatest tention on the lifting of the mass; consequently, the mechanical conditions of the problem would lead us to infer cracks at right angles to the present valleys instead of along them. Take, for example, the ridge from Monta Rosa over the Lyskamm and Breithorn to the Matterhosn; the upheaval of that ridge could not possibly produce rents in the position now occupied by the Val Tournanche, the Val d'Ayas, and the Val du Lys. The line of strain would be parallel to these valleys, and hence the line of fracture, if fracture at all occurred, across them.

A sufficient consideration of the subject must, I think, result in the conclusion already expressed, that a general elevation of the land formerly existed, and must limit us to the question, "By what agency has this land been scarred so as to exhibit the valleys by which it is now intersected?" These valleys are the tracks of rivers, and have been manifestly formed with reference to the discharge of the aqueous precipitations which occurred on the heights. An eminent

* Communicated by the Author to the *Philosophical Magazine.*

Swiss geologist, with whom I had an opportunity of conversing a week or two ago, called the Alpine valleys "Auswaschungsthäler," valleys cut out by the action of water. For some years an opposite conclusion has been gradually forcing itself upon me; and this year I completed a chain of evidence which leaves little doubt upon my mind that a mightier excavator than mere water has been at work among the Alps, and that the country owes its present conformation mainly to the action of its ancient glaciers.

It requires some time to realise the stupendous scale on which the ancient ice has operated; and were its traces less indubitable, the judgment would halt before accepting a conclusion involving operations so vast as almost to appear fabulous. This year I walked for the fifth time up the valley of Hasli, observing the action of the ancient glacier upon its boundaries. A million winters may have acted upon these scarred and fluted rocks, and still the scars and the flutings are as distinct as if they had been executed last year. We trace them down to the banks of the Aar, a river which has been rushing for these ages through the valley; and the smallness of its operations must impress us with the *comparative* feebleness of denudation by water. A mighty glacier occupied the valley of the Rhone. I traced it all along the valley to Martigny, a distance of more than sixty miles from the end of the present Rhone glacier. Here, reinforced from Mont Blanc, it ploughed its way towards the Lake of Geneva. Near a station called D'Evionnaz, the *roches moutonnees* rise above each other in heaps, and here, as in Haslithal, the polishing comes down close to the level of the present Rhone,—thus suggesting how *comparatively* small has been the action of the river from the disappearance of the glacier to the present day.

The same thought is continually forced upon the traveller on the south side of the Alps, where the traces of ancient glacier action are, if anything, more astonishing than on the north. Two years ago I had an opportunity of inspecting the Val Tournanche from Breuil to Chatillon. This year I crossed the Cimes Blanches from Breuil, wandered over the ancient névés of the place, penetrated the higher ramifications of the Val d'Ayas, and everywhere found the sculpture of the ancient ice. Crossing the Col Betta Furka, and looking down the Val du Lys, the work of the glacier which once proceeded from the slopes of the Lyskamm was immediately manifest. I traced the action through this noble valley, as far as Gressonay St. Jean; everywhere on the valleys' flanks the same truth was proclaimed. What air and water have accomplished since the disappearance of the glaciers are mere scratches of the tooth of time, in comparison with the mighty furrows which had been previously ploughed out.

From Gressonay I crossed the Col de Val d'Obbia to Alagna, and everywhere I trod upon ground deserted by the ice. Like its neighbour of the Lys, the Val Sesia also formed the bed of a mighty glacier. From Alagna I crossed the Turloz; the traces of the ice are here magnificent, and on the flank of the Val Anzasca, opposite the place where the glacier from Mont Turloz joined that from Macugnaga, the rocks are wonderfully worn; all up the Macugnaga valley to the base of Monte Rosa the same grand evidences appear, forcing upon the mind the existence of a state of things so extraordinary that, were the proofs less strong, the imagination would shrink from any attempt to realise it. I have repeatedly explored both the Saasthal and Nicolaithal; both of them are glacier channels; an expanse of particularly finely-rounded rocks may be seen on the side of the Saasthal at the place where the road turns up to the valley of the Fee.

Having finished the exploration of this part of the country, I felt a strong desire to visit the Jura, and to observe for myself the boulders scattered over its slopes. I accordingly went to Neuchatel, visited the celebrated Pierre-à-Bot, and examined the general character of the moraine-like matter which is strewn over the slopes. Granite boulders were abundant, being in many cases quarried for building use. The Jura, as is well known, yields no granite; it is composed of limestone. Whence, then, did these blocks come? Limestone is a partially soluble rock, and hence, when long exposed to the air, although it may preserve the general form imparted to it by the grinding action of a glacier, it does not retain the finer striæ which enable one to determine the direction of motion. I therefore sought for slabs of limestone from which the protecting soil had been recently removed, and was fortunate enough to find some very fine ones, in which the glacier scratches were marked with perfect distinctness. I determined the direction of these scratches at three different places, and found them coincident: they all pointed to Mont Blanc,* which was the place where the ancient glaciers had received their load, carrying with them across the Canton-de-Vaud, occupying the bed of what is now the Lake of Neuchatel, and depositing them on the slopes of the Jura. The railroad between Neuchatel and Brienne has disclosed several well-scarred rocks; the evidence of glacier-action is here just as conclusive as in the other parts of the Alps; and the fact of ice moving thus across the country from Mont Blanc to the Jura, fortifies the conception previously formed of the magnitude of the phenomenon.

It is, then, perfectly certain that all this mountain region was held by ice, enormous as to mass, and in incessant motion. That such an agent was competent to plough out the Alpine valleys cannot, I think, be doubted, while the fact that during the ages which must have elapsed since its disappearance the ordinary denuding action of the atmosphere has been unable, in most cases, to obliterate even the superficial traces of the glaciers, suggests the incompetence of that action to produce the same effect. That the glaciers have been the real excavators seems to me far more probable than the supposition that they merely filled valleys which had been previously formed by water denudation. Indeed, the choice lies between these two suppositions:—Shall we assume that the glaciers filled valleys which were previously formed by what would undoubtedly be a weaker agent? or, shall we conclude that they have been the excavators which have furrowed the uplifted land with the valleys which now intersect it? I do not hesitate to accept the latter view, and this view will carry us still further. According to it the glacier is essentially self-destructive. The more deeply it ploughs the surface of the earth the more must it retreat. Let the present Alpine valleys be filled to the level of the adjacent ridges, and vast glaciers would again start into existence; but every one of these valleys is a kind of furnace which sends draughts of hot air up to the heights, and thus effectually prevents the formation of ice. While standing on the summit of the Grauhaupt a week or two ago, I was perfectly astonished at the force with which these gusts of heated air rose vertically from the Val du Lys. Marked by the precipitated vapours which chanced to be afloat at the time, the vertical gusts were often as violent as the draught from a factory chimney. Thus, given the uplifted land, and we have a glacial epoch; let the ice work down the earth, every foot it sinks necessitates its own diminution; the glaciers shrink as the valleys deepen; and, finally, we have a state of things in which the ice has dwindled to limits which barely serve as a key to the stupendous operations of a bygone geologic age. To account for a glacial epoch, then, we need not resort to the hard hypothesis of a change in the amount of solar emission, or of a change in the temperature of space traversed by our system. Elevations of the land, which would naturally accompany the gradual cooling of the earth, are quite competent to account for such an epoch; and the ice itself, in the absence of any other agency, would be competent to destroy the conditions which gave it birth.

Royal Institution, August 18, 1862.

* That is, in the direction which a local guide pointed out as that of Mont Blanc. The mountain itself was not seen.

AMERICAN IMPROVEMENTS IN TANNING.

THE following is from a contributor to the *Shoe and Leather Reporter*:—

"Among all the improvements of the age the American tanners have kept up with the times. There are many names to be remembered in this connection. Toby, of Hudson, made the first bark mill, and it has been little improved since his time. To Perego and his partner we owe the improved apparatus now used to draw the liquor from the bottom of the vats. The original heater for leaching bark was first used by a Quaker tanner, near Poughkeepsie, and it was afterwards improved and patented by another. The invention of the roller was always claimed by Jeremiah Guyle, also by Deacon Munson, though patented by Col. Edwards."

At the commencement of the present century, few establishments had adopted either steam or water power, but now in this State alone we have 125 tanneries supplied with steam engines, and 418 which use water power.

In the year 1826, by a more judicious use and a more scientific gradation of the tanning liquors, and by omitting to skive, we began to make a greater proportionate weight of leather; a change productive of many advantages, not the least of which was that it left money in the bank. In my early days, 16, 20, and 30 per cent. was called a good gain of weight. Now, 50 to 80 per cent. is none too much.

I well remember an old tanner who, passing his journeyman as he was hard at work skiving down the butts and necks of the hides on the beam, patted him on the shoulder, and said:—"Young man, I had rather pay you to leave that on." Neither tanner nor journeyman have lost anything by that lesson."

THE DECIMAL SYSTEM OF WEIGHTS AND MEASURES.

THE report of the select committee appointed to consider the practicability of adopting a simple and uniform system of weights and measures is published. The following recommendations are laid before the house, together with a great mass of evidence and tabular appendices:—

1. That the use of the metric system be rendered legal. No compulsory measures should be resorted to until they are sanctioned by the general conviction of the public.

2. That a Department of Weights and Measures be established in connection with the Board of Trade. It would thus become subordinate to the government and responsible to parliament. To it should be entrusted the conservation and verification of the standards, the superintendence of inspectors, and the general duties incident to such a department. It should also take such measures as may from time to time promote the use and extend the knowledge of the metric system in the departments of government and among the people.

3. The Government should sanction the use of the metric system (together with our present one) in the levying of the customs' duties; thus familiarising it among our merchants and manufacturers, and giving facilities to foreign traders in their dealings with this country. Its use, combined with that of our own system in government contracts, has also been suggested.

4. The metric system should form one of the subjects of examination in the competitive examinations of the civil service.

5. The gramme should be used as a weight for foreign letters and books at the Post-office.

6. The Committee of Council on Education should require the metric system to be taught (as might easily be done by means of tables and diagrams) in all schools receiving grants of public money.

7. In the public statistics of the country quantities should be expressed in terms of the metric system in juxta-position with those of our own, as suggested by the International Statistical Congress.

8. In private bills before parliament the use of the metric system should be allowed.

9. The only weights and measures in use

should be the metric and imperial, until the metric has been generally adopted.

10. The proviso in the 5th and 6th Wm. IV., chap. 63, clause 6, allowing the use of "local and customary measures" in cases were the vessel employed "is not represented as containing any amount of imperial measure or of any fixed local or customary measure heretofore in use," should be repealed, as giving facilities to evade the statute.

11. The department which it is proposed to appoint should make an annual report to parment.

REVOLVING FIRE-ARMS.

MR. J. DEANE, junior, of King William Street, gun manufacturer, has just obtained a patent for "Improvements in revolving fire-arms."

The invention relates to pistols, rifles, and other small fire-arms in which there is a revolving breech chamber, and consists in so constructing the breech as to admit of such chamber being loaded at the rear, as hereafter explained.

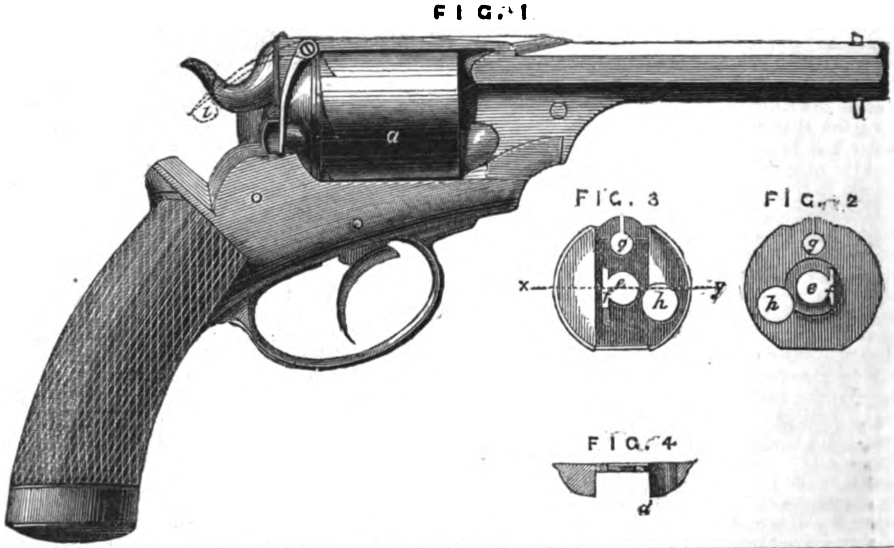
The invention consists in the employment of an independant breech-piece or shield, together with a revolving chamber, in which the compartments for receiving the charge are bored or formed entirely through the length of such chamber. Through this breech-piece and on one side an aperture is made, through which a cartridge is inserted into one of the compartments of the revolving chamber; the chamber is turned so as to present another compartment, and so on until the whole of the compartments have been charged. A plate connected to one end of an arm, free to move on a pin connected to some fixed part of the arm, is then brought down to close the aperture in the breech-piece, and the pistol or gun is fired by the hammer striking through an aperture made for the reception of the nose thereof in the shield on a cap or detonating powder at the rear of the cartridge.

Fig. 1 of the above engravings is a side elevation of a revolving pistol, showing the invention applied thereto. Fig. 2 is a face view, fig. 3 a back view, and fig. 4 is a section, through the line *xy* of fig. 3, of the independent breech-piece. *a* is the chamber, with compartments for holding the charge bored throughout the length of the chamber, free to revolve on a spindle in the usual manner; *b* is the independent breech-piece passed over the spindle; it is planed out at the back to form a recess, into which the lump *c* enters the sides; *d d* overlap the sides of the lump; *e* is the aperture through which the spindle passes; *f* is the slot through which the lever for causing the rotation of the chamber works; *g* is the opening to allow of the hammer striking the cartridge, and *h* is the aperture through which the cartridges are inserted into the compartments in the revolving chamber. The entrance to the aperture in the shield is rounded off, to facilitate the insertion of the cartridges; *i* is a plate on the end of an arm *k*, free to turn on the pin *l*. This plate is turned to cover the aperture *h* after the chamber has been charged. It is turned up, as shown by the dotted lines, to allow of the insertion of the cartridges into the compartments in the chamber.

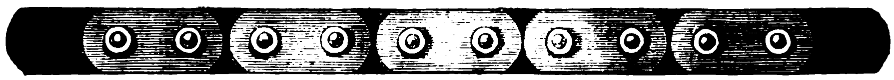
The chamber and the breech-piece or shield are capable of being removed, when a revolving chamber fitted with nipples may be substituted. Should the prepared cartridges be exhausted, it may be desirable to unship the breech-loading chamber and breech hereinbefore described, and use the arm as an ordinary revolving chamber, pistol, or gun. In like manner, this invention may be applied to breech-loading guns and fire-arms where a revolving chamber of the ordinary construction is now used.

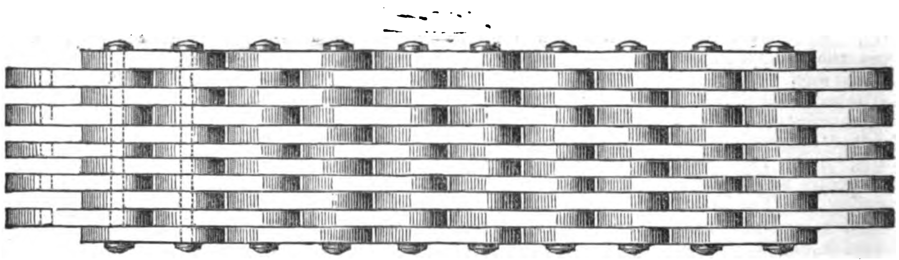
The largest artificial reservoir of water in the world was completed last month to supply the city of New York with water. It is situated in the central park in that city. The purchase of the land cost £100,000, and the formation of the reservoir cost £300,000; 96 acres are covered with water. The depth of the reservoir is 50 feet, and it would hold 1,100,000,000 gallons of water.

REVOLVING FIRE-ARMS.



AN IMPROVED MILL BAND.



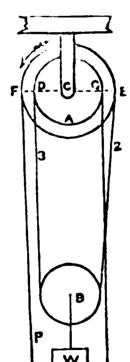


PAYNE'S FLAX MACHINE.

THIS machine, patented by Mr. B. Payne, of Chard, Somerset, consists of a box or case in which the flax or other fibrous material to be operated upon is to be placed. The bottom and sides of the box are provided or lined with corrugated, roughened, indented, or toothed metal friction plates, as shown in the above engravings, against which the fibrous material is rubbed by the action of the beaters, and is thereby submitted to considerable friction. Part of the bottom of the case is formed of a steam chest, which is supplied with steam from a boiler, and is covered with a plate of copper and another of lead, with a layer of felt between them. By this combination of plates of copper and lead, with a sheet of felt between them, a bed is obtained possessing a certain amount of elasticity, and one that is also capable of holding and tempering the heat given off from the steam chest. A perforated steam pipe is also let into a suitable recess at the bottom of the case, and steam is injected therefrom into or on to the mass of fibres in the case, while the material is being submitted to the friction of the beaters. The back part of the case is made moveable on a hinge, and is adjustable so that it may be moved into a forward or backward position on such joint by means of the screw adjustment. The screw passes through a nut in a crosshead, fixed in jointed arms, attached to the moveable part of the casing, and this moveable part is secured in any desired position by means of a click or pall, which takes into the ratchet wheel on the end of the screw. Hollow beaters provided with toothed, serrated, indented, or roughened surfaces, both at their faces, backs, and sides, are secured on the ends of arms, which are mounted on pivots at the upper end of the vertical standards. A tappet wheel provided with arms, is mounted below the projecting ends of the beater arms, and as the tappet wheel rotates, it will lift up the beaters, and allow them to fall upon the raw flax or other fibrous material that is placed in the apparatus. Openings are made in the sides of the case to allow the dust from the fibres to pass off. This beating action creates a considerable amount of friction, and, in addition to this, steam is injected from the perforated pipe. By the combined operation of the beaters with the steam and heat, the woody parts of the plant are detached from the useful fibres, and the latter are rendered soft and brought into a proper state for the subsequent operations of heckling, combing, and spinning.

DIFFERENTIAL PULLEY BLOCKS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."



SIR,—For your own satisfaction as to the truth of my previous note, I beg to enclose you a copy of the passage in Carpenter's "Mechanical Philosophy," which I referred to.

"An extremely simple and ingenious application to the pulley of the principle which has been mentioned under the head of the Chinese wheel and axle, has been devised by Mr. Moore, of Bristol. Its beauty consists in permitting an increase of power to any extent by the employment of only two pulleys. Its construction will be readily understood from the accompanying diagram. A is a fixed pulley with two grooves of which one is a little larger than the other. An endless cord passes over the larger groove from F to E, then beneath a moveable pulley, B; after which it returns over the smaller groove from D to G, and hangs down, so as to become continuous with the first line. Now, if a power be applied at P, so as to draw down the line 1, the line 2 will be raised to the same amount, and the circumference of the pulley A will move through the same space. Supposing that the line 3 were fixed at its extremity, the pulley B would be raised by half the amount to which the line

2 is shortened. But the revolution of the pulley A, whilst it draws up the line 2 over one groove, lets down the line 3 from the other. If the 2 grooves were of the same size, therefore, the pulley B would not be raised, since the line 3 would descend as much as 2 ascends. But, in consequence of the different size of the grooves, the line 3 does not descend as fast as 2 ascends; and the rise of the pulley B will, therefore, be equal to half the difference in the amount. But if the larger groove have a circumference of 18 inches, and the smaller of 15 inches, the line 2 will be drawn up by one revolution of the pulley A through 18 inches, whilst the line 3 will descend through 15. The moveable pulley B, with the weight attached to it, will consequently be made to ascend through 1½ inch, whilst P descends 18, and the power gained will be 12.

"The reason of this gain of power is at once seen, by considering that the action of the weight upon the string 3 tends to turn round the pulley in the direction of the arrow nearly as much as the action of the string 2 tends to turn it in a contrary direction; and that a small force applied to P will, therefore, overcome the difference. If, as in the present instance, the distance from C to D be 15, and from C to E 18, a weight bearing on the string 3 would cause the pulley A to move in the direction of the arrow with a power of 15, whilst the same pressure on the line 2 would make it turn in the contrary direction with a power of 18. The difference between the two strains, therefore, will be the real amount of resistance to be overcome by a power applied to the circumference of the larger groove of the pulley A; and this will be one-sixth of the strain upon either of the strings. But this strain is only half the total weight suspended to B, and the power of the combination will hence be 12. It may be increased to any amount, by diminishing the difference between the two grooves. Thus, if the larger one have a diameter of 100 parts, and the smaller one of 99, the resistance to the motion of the upper pulley will only be 100th part of the weight bearing on each string, or 200th of the whole weight suspended to B. As the cord has no fixed extremity, and as the action of the pulleys would be altogether destroyed if it had the power of *sliding* over them, it is necessary to take some means of preventing this. The simplest is the employment of a chain, instead of a cord, the links of which are laid hold of by pins projecting from the surface of the wheels. The author may express his surprise that this ingenious invention has not come into more general use, since it enables any amount of power to be obtained without any corresponding enlargement of the apparatus, or increase of friction."

I now find that Mr. Weston has patented this invention of twenty years since—another instance of wasted money from imperfect investigation.

I am, Sir,
Yours obediently,
ARTIZAN.

London, 15th Sept., 1862.

AN IMPROVED MILL BAND.

The above engraving illustrates a mill band of a novel construction, which consists of a number of small pieces or links of leather, pinned together in such a manner that a flexible band is secured. The inventor, C. M. Roullier, of Paris, proposes to use waste pieces of leather for the purpose, and to gain sufficient strength the outer links may be of metal. The straps can be made of any width to suit any class of machinery. We feel confident our engineers, generally, will see the advantage of the above invention, which will tend to obviate the great loss of time occasioned by the breaking of straps.

DOUBLE GUNBOATS.—SUBMARINE CABLES.

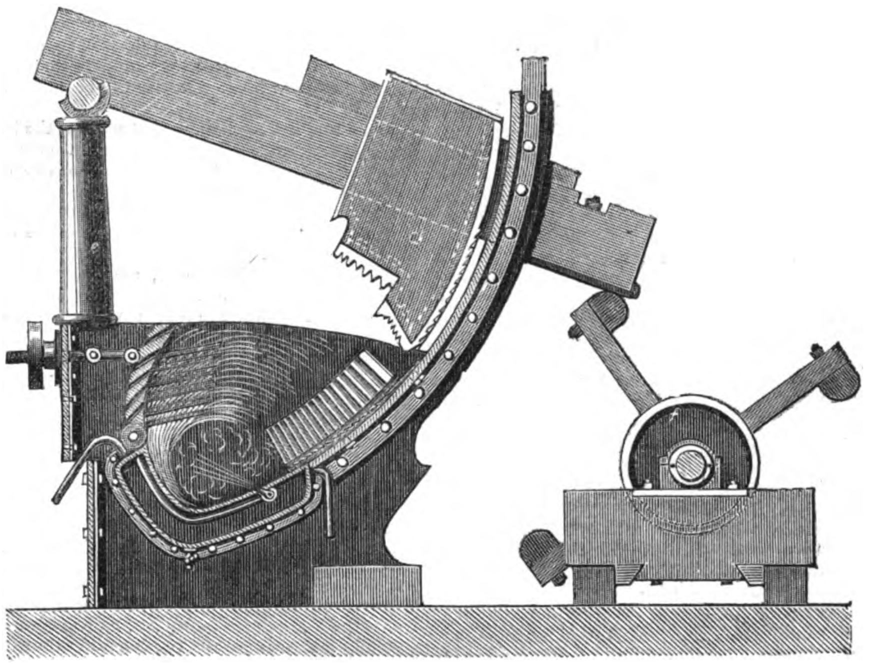
TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Dear Sir,—There are two subjects to which reference is made in your last number, and in which I am particularly interested. I refer first to the Atlantic telegraph cable, and secondly to the proposition about double gunboats made to the admiralty.

I hope you will allow me to make a few observations on each of these.

With respect to the latter, I am much obliged by your recalling to the recollection of your readers (no inconsiderable portion of the scientific public) the fact that, some time since, I had written a letter to the Mechanics' Magazine on the subject, proposing the utilization in this way of our fleet of old gunboats; and I have to remark that the proposition, which is now mentioned as being listened to at the admiralty, embraces some fallacies, from which I had thought it necessary carefully to guard my project.

PAYNE'S FLAX MACHINE.



One of these fallacies is the heaving of two bows. Were this done, I do not hesitate to say that the speed would be more likely to be four knots than twenty-four. Not being so sanguine, and having possibly a little more experience of what gunboats *will do*, I should be very well satisfied to get the half of 24 knots, and I should expect to obtain that result—not by complicating the machinery with *anybody's* paddles, but by using the two screws as they are. The gunboats would be as useless as they are now for purposes of coast defence against rams or molten iron, shells, if they did not carry armour; and I do not believe that this could be done efficiently if there were paddles, horizontal or vertical, under water or above it, applied at the sides. The ram to which they certainly ought to possess can be no where so safely placed as between the two bows, while being there it would prevent the water getting "wedged" at that part, which would certainly cause, if it did occur, quite as much retardation as I have just stated.

Of course I do not believe that these are the best vessels which could be constructed for the purpose, but it would be a cheap way of trying the experiment of double screws, rudders, &c.; and I believe that two or three of such vessels would be very awkward customers for any of our present ironsides, which are no more safe against rams than the oldest wooden ship.

It should be remembered that longitudinal compartments as well as transverse ones are the only real defence (if defence be possible) of an iron ship against rocks and rams. It is all very well to say that merchant ships have been saved with one compartment, or even two, full of water; but what, we may ask, would be the consequence if in that or those compartments had been situated in a man-of-war, the engines with their fires, the magazine with its supply of powder, the shell-room, or even the shot-locker; longitudinal partitions, therefore, must be built answering to what used to be called the wings of the orlop deck, and which were always kept clear for stopping shot holes, when taking place, as every sailor knows they did, at or below the water line. These must be placed fore and aft the ship (they might contribute largely to the strength of the structure) at least 10 feet in from the side, or as far as the blow of a ram might be likely to bulge in or pierce it. These compartments, again, should be divided into cells by transverse *fixed* partitions so as to confine the leakage as much as possible.

As none of the modern armour plated ships carry their armour, even with all their coals on board—much more than five or six feet below the water line; and as they do not seem, to say the least of it—*indisposed to roll*—it follows that on active service, they would very frequently be pierced below the armour by shots and shells of certain descriptions, while that of course is the part which will always be attacked by a ram.

There is but one form of vessel which could attain a high speed, carrying efficient armour throughout above, and unpierceable by rams; that is, an extremely wide and shallow one, great beam and light draught. But this is not easily compatible with screw propulsion, though there are other methods which might be adopted. My present aim is to show how defects may be remedied in existing structures, not to make proposals of the best possible new one. I certainly cannot regard any of those recently built, or now building as being great strides towards the "*Fleet of the future*," seeing that there is not one of them that would dare to closely ngage an efficient ram, even if only a tenth of her size.

The Submarine Telegraph.

But I turn to the other subject, one which I confess has many more attractions for me than any scheme for the improvement of means of destruction. The submarine telegraph, one of the great bonds of peace to the whole human race; and here, too, I wish to overthrow some fallacies.

If any of your readers will take the trouble to look at Captain Dayman's soundings they will see that there is a distance of about ten miles between each of them wherever this could be done. I have not the book before me at present, but I can affirm that in the presence, and with the assistance of Captain Becher, examined the latitudes and longitudes of each of the soundings near what has been falsely called the Irish precipice. On reducing the miles distance between those soundings into feet, as also the depth, we found that the rise was about 1 in 16—a little less steep than Holborn-hill.

I am credibly informed that even this is more than can be proved to exist since the "Porcupine" has sounded over the ground again. But who in their senses, if it did exist, would think of such a declivity as a "precipice," or try to show that this was the cause of the damage to the late Atlantic cable, unless to cover *peculiar proclivities.*

"Bad workmen always find fault with their tools," and the "moral causes," which never

should have existed, as well as the physical causes, which never did exist, have been far too heavily blamed for shortcomings of the gentlemen who have been learning "*how they cannot do it*." But the special value of the "Porcupine's" voyage of discovery seems to have been divided between the finding of a "gap" which nobody wanted, and the survey of a cod-bank, which can surely have very little to do with a cable. On which of these subjects is the Admiralty about to make a communication to the Atlantic Telegraph Company, with a view, of course, to the raising of fresh capital, and what will be the security against further loss to shareholders?

Mr. Cyrus Field, who is certainly a most energetic director, can, I fear, as little galvanize into life a defunct company as a destroyed cable; and one would imagine that the Federal government, who may or may not be now at Washington, have nearly enough to do with what money they have (leaving paper out of the question) without helping us to lay a cable.

If the problem of an Atlantic cable is to be rightly solved, it must be done by a company who have been fortunate enough to profit by the experience, without having incurred the losses incidental to a want of success; and though this may seem hard measure, it is not really so, for companies are not in the same position in this respect as individuals.

A company may always be re-constituted, and those who lost by the first scheme can always, if they choose, try to recover their loss by a wise use of the experience they have bought. But no person having a choice would be likely to attach himself to an association, which rejecting experience, fighting against facts and advocating unumbered fallacies, should offer only the old encumbrances which have ruined, and the old method which have failed, backed by a bet, that this time it *will* be done, that bet being very much on the principle of heads I win tails you lose.

I have lately also seen a notice of the lying of a cable across the North Sea with the aid of fishing boats stationed at intervals. I hope the said fishing boats will not be brought forward as a good idea for the Atlantic cable; but there is no telling what folly may not be proposed, I confess I think it a very clumsy expedient even where it *was* adopted, and it certainly does not seem to have had the effect of getting rid of kinks. They speak of these occurring and the "*brave*" way in which they were pulled out. When will cable manufacturers and *layers* be convinced that the wise thing to do, is to avoid making kinks, not to claim credit for pulling them out? and that this can only be done by winding on a reel, not coiling in a hold?

Half or two-thirds the damage which has been ascribed to other causes arises from this source, and it cannot be too strongly impressed on those who study the subject, that a kink may be, and often is, fatal to the insulation of a copper conductor, whether pulled out or not, and certainly never does it any good.

Another thing is, that no ship ever anchors in water so deep as 60 fathoms if she can help it, and can very seldom recover her anchor if she does, so that damage from that cause ought to be much more limited than has yet been the case.

In shoal water there is, no doubt, considerable difficulty from ships' anchors, but this might be met by heavy rewards for conviction of offenders, almost as well as by heavy cables which involve great difficulty in lifting when damage occurs, which it is sure to do sooner or later. I should prefer, even here, a moderately light cable, with the strength in the centre, for the greater portion, to be laid slack, and a considerable reward for everyone who, having caught it, threw it off uninjured, or for conviction of any one who wilfully damaged it. There are certain portions of every shore off which vessels never anchor. Let these be chosen for the telegraph route rather than the straightest line between two points, and then the submarine companies may look for a rise in the dividends, and their cables will not be such bugbears in the accounts. This is the reason why some submarine lines *have not cost a shilling for repairs*, while others go far into thousands of pounds for the same purpose. Telegraph companies would often do well to remember that "the longest way round is sometimes the shortest way home," under the ocean as well as on it.

I was told not long since that some of the leading telegraphic engineers express themselves "sick of submarines." I am delighted to hear it, for now the nautical engineer may have a chance of being listened to, and of showing that all science is not confined to those who know nothing of the sea.

That the difficulties can be, and will be, overcome, that the cable will eventually be laid, I am as confident as that the earth moves. That I may be one of the humble instruments in doing so I fervently hope, and try to qualify myself for—not by ignoring, but by consulting facts—not by pride and prejudice—but by patience, perseverance, and as much sweet oil as I can afford—for fallacies.

J. N. SELWYN, Capt., R.N.

Chequers Court,
Tring, Herts.

AN AMERICAN IRON-CLAD STEAMER.

The United States iron-clad gunboat "Passaic," which has been known as the Ercisson Battery, No. 2 (the "Monitor" being No. 1), has been successfully launched at the Continental ironworks, Greenpoint. The "Passaic" is an iron-clad steam gunboat of 1,000 tons burden. She is 200 ft. long, 45 ft. wide, 12 ft. deep, draws 7 ft. of water now, and will draw 9½ ft. when laden. These figures would give a good idea of a wooden vessel; they can convey no impression of this one. She looks like a huge coal barge with a sloping house on deck. She is as thick as two ordinary vessels. The width of iron which is laid on a hull of extraordinary strength is 5 in. The turret is covered by wedges twice as heavy, being no less than 11 in. thick. The mail covers the entire craft, and goes beyond the bow, where it becomes a ram. It also extends 3½ ft., or half the entire draught of the vessel, below the water-line. In action, then, a ball cannot strike an exposed part, because there is no part exposed. Even the prow, or ram, might be broken clear off without serious damage to the vessel. Under each deck-beam of the upper part of the vessel, from turret bulkhead, there are three rows of stanchions of 2¾ bar iron, fastened by 1-in. bolts. Aft the turret bulkhead there will be only one central row of stanchions. Rope stanchions are placed around the vessel at intervals of 10 ft., to be made of wrought iron, with an eye at the top for receiving the rope rail. A series of powerful strong belts are also introduced all around the vessel. The vessel is provided with six water-tight compartments, connected with each other, with suitable doorways. They are formed of 1½-in. plate, butt-jointed and riveted flush. The turret is 21 ft. internal diameter. The plates, which are 11 in. thick, are applied in 20 sections, and joined vertically in such a manner that there is only one joint at any one place. The turret plates rest on a flat ring, made of composition metal 1½ in. thick and 12 in. wide, provided with a vertical flange on the inside 2½ in. high and 1½ in. thick. The top of the turret is formed of wrought iron plates, 1½ in. thick, resting on forged beams and railway bars, placed 3 in. apart inside the turret. Certain portions of these plates are perforated with holes 1 in. diameter. In the centre of this plating a circular aperture is made, 6 ft. in diameter, over which the pilot house, of equal diameter, is to be placed. The armament will of course be in the turret, which is intended for two 15-in. Dahlgren guns. The machinery consists of two engines, which are on board. They were built at the Delamater Ironworks, and have cylinders 40 in. in diameter and 22 in. stroke. The blower engines and blowers are of greater size than those of the "Monitor;" and, instead of being placed in the engine-room, are applied under the turret roof, forcing air into the boiler room and other parts of the vessel. Two boilers, of Martin's plan, are attached, of 10 ft. face, 9 ft. 3 in. high, and 12 ft. 6 in. long, with three furnaces in each. These boilers rest on 16-in. floor plate, to be felted and leaded, and furnished with all approved appurtenances. The propeller is made of cast iron, 12 ft. in diameter, with 16 ft. pitch. The "Passaic" cost 400,000 dols., which is the price to be paid for all her sister ships.

THE TRUE PRINCIPLES OF AIR NAVIGATION EXPLAINED.

TO THE EDITOR OF "THE MECHANICS' MAGAZINE."

SIR,—I feel I ought not to trespass further upon your valuable space in discussing this subject; but, as Mr. Cheverton regrets that I have not improved by his previously edifying epistles, perhaps you will permit me to enquire, how is it that he condemns the competency of his favourite authority, to whom he has pointed as worthy of my consideration? He states: "I refer him to Hutton's table of experiments, from which he may ascertain that the air will oppose to such a wing surface a resistance of about one-tenth of an ounce!" and afterwards informs me that "at any rate, be the number of strokes what they will, and however we may stumble in calculation, a resistance of the air proportional to the square of the velocity, or a little beyond it, [how liberal!] and a series of absolute resistances determined by experiments [was Hutton's table the result of absolute experiments, or the conclusion of his 'theoretical phantasy?'] and which, perhaps, for sundry reasons, are somewhat greater in fact [how reliable!] than are given in Hutton's tables."

I certainly was unprepared to apply the strict law of the squares, which altereth not, in the liberal manner permitted by Mr. Cheverton; but in his way it certainly seems capable of meeting the requirements of the case; for, after squaring the velocity, if that fails, "the amount of resistance should be doubled" for concave surfaces; and another authority informs us that it should be trebled for convex surfaces; and, should this still prove insufficient, we may reduce the velocity as 1·414 to 1. Then, if this still fails to satisfy the requirements, we are permitted to "increase the velocity of the down strokes in the same ratio (of course without the bird's consent), which will reduce the number of strokes to seventeen, and this number may be again further reduced (perhaps half), for the other reasons mentioned," in Mr. Cheverton's letter or elsewhere, when at last "we should arrive at a number of strokes per second not at all extraordinary!" So I think: for it is not at all wonderful that, after all this squaring and doubling, and trebling and reducing, and increasing and reducing again and again, as the case may require or demand, that at last it should give results somewhat similar to those actually observable in nature, viz., that a wing surface which at the outset would only obtain a resistance equal to about 0·1 oz. will, after all this modification, prove capable of raising a bird weighing 1¼ lbs., or obtain a resistance 280 times greater than at first, which is a very satisfactory conclusion!

But I had thought that we might, like flying animals, take a shorter cut to attain this result, by demonstrating that the weight of the body on the surface of the propellers is proportional to the weight of the air upon the same surface, and that their respective velocities, therefore, must also be proportional; and which, I hope, may sooner or later meet Mr. Cheverton's approbation.

Mr. Cheverton also asserts it "to be a serious error to bring forward the elasticity of air as affording resistance to compression on which propelling efforts in flying are to act;" and requests me to "check suddenly the motion of a pasteboard surface 1 foot square," saying, "I shall not perceive the slightest elastic rebound from the compression of the air." What a powerful proof of its non-existence! Suppose, however, the pasteboard surface to be carefully cemented to the top edges of a cubical vessel of the same area, and then taken to a considerable height in the atmosphere, will the surface then experience even "the slightest elastic rebound from the compression of the air?" Of course not—because the vessel was simply filled in the open air; that is, if all the sides be sufficiently strong, and the pasteboard surface sufficiently weighted, to overpower such elastic force, due to the pressure of the atmosphere, at or near the level of the sea, and which, at a height of three miles, would exert an internal pressure equal to about half a ton on every side. Will such pressure or resistance be due to its weight, inertia, gravity, or what? Mr. Cheverton afterwards tells us: "Still it is possible that compression and elasticity come into play with very low veloc-

ities." Mr. Cheverton's faith in his own assertions surely begins to waver; and, I believe, if he will study the subject a little further, he will soon become fully prepared either to deny or admit its existence altogether, and not partly acquiesce in an opinion involving his imaginary "serious error." In the meantime, I shall be happy to follow his advice as proposed, and if possible, "correct my views by practical experiment." Allow me, sir, also to return the compliment, and propose to Mr. Cheverton to withdraw his "balloon-directing" ideas from the question, and try for himself the experiments he suggested for my consideration; he may then attach such importance to the results as seemeth him best.

I am, sir, your obedient servant,
W. QUARTERMAIN.
10, Clarendon Place, Edgware Road.

THE WAVE LEVEL.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Sir,—The wave line, as a water line for a ship's bow has been proved to be disadvantageous. Ships have had the concavity filled up and they have been improved by the alteration.

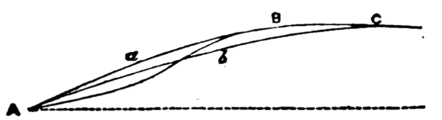
The sailing ship "Fiery Cross," which won the prize from China last year, bringing home the first teas, was designed, I believe, by Mr. Rennie; and the lines of her bow between the light and load water-lines are convex—I think they are parabolic curves.

I know of no vessel having the wave-line bow which is pre-eminently fast, unless her speed may be fairly attributable to her engines. In sailing vessels the wave-line may be said to have been fairly exploded. I also know of a yacht, designed by Mr. Russell himself, the property of the Duke of Sutherland, which vessel is now lying in the Victoria dock; and, although the production of that talented gentleman himself, she must, as regards speed, I am afraid be deemed a failure.

The bow-line, which will enable the vessel to pass through the water with a minimum of elevation to the fluid, appears to me to be the best line, but I have never seen a vessel with a wave-line bow under weigh without observing a great elevation of water at that part where the greatest concavity of curvature takes place, or where what a ship master called that d——d hollow in his bow.

The wave-line is a source of weakness, and it diminishes capacity. These considerations are important.

Those who argue in favour of the wave-line bow ignore the latter consideration. Let A B be a wave-line bow, and A a B a convex-line bow.



They argue as if the question were between those two lines, forgetting that with the latter there is a great increase of capacity and buoyancy; the former commercially advantageous, and the latter contributing to the structural strength of the vessel The real question would be between the wave-line and the inner convex line A b c. For this line would produce about the same capacity.

Now, if any gentleman, having a vessel distinguished for her speed, with a wave-line bow will be kind enough to state her name, I will undertake to design a vessel which shall beat her in speed, with *the same* capacity, length, breadth, and depth. Perhaps the above illustration will be sufficient to indicate to your readers why I should be able to do so.

I say nothing of wave or concave lines below the water-line, they are indispensible, and every practical naval architect knows why.

NAUTICUS.

THE STRAIGHT LINE *VERSUS* THE WAVE LINE FOR VESSELS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Sir,—It is with great pleasure I recognise in Mr. Young the candid disposition which enables him to perceive, and, yet more, to acknowledge, his misconception on one point of my observations on this subject If the same estimable quality of mind had been conjoined with a little more attention, it would have preserved him also from the misapprehension of supposing that, whilst alluding to the form of a fish as affording a better analogy for consideration in determining the shape of the bow of a vessel than "the glacial wave-line cutwater," I had failed to mark the distinction between a body floating on and wholly submerged in water. I thought I had sufficiently indicated, although in a word only to the wise, the respective conditions of human and piscine existence, and thence the necessity of some modifications in any form suggested by the analogy, when I said that "we wish to keep our skins dry, but fishes would rather keep theirs wet."

It would, however, be easy, from the contemplation of the heads of fishes, to argue very plausibly in favour of straight lines for the bow of a ship rounded off at their junction with her sides, but, in truth, I have little faith in conclusions derived from analogies, except in regard to certain leading principles, and those only in the abstract; for nature herself, in their application, subordinates them, more or less, to the conditions or exigences of the several varieties of existence, even down very near to particular cases. The pike and the carp have their forms determined in accordance with the nature of their food; and whilst the principle of the inclined plane for the diminution of resistance is obvious enough in the one case, because it is a fish of prey and requires to move with great velocity, in the other, judging at least by the outlines in elevation, the principle would almost appear to be ignored. The whale presents a more glaring instance of departure from principle, doubtless in fulfilment of high purposes, and in obedience to a higher law in the domain of final causes. Man, indeed, in his contrivances, is less trammelled with conditions than nature, and is enabled to give a more perfect allegiance to principles, for his objects are narrow and exclusive, and working upon dead matter he is freed from the necessity of keeping up the vital continuity of parts. I advance, therefore, no argument from analogy on my side of the question. I merely retorted, that it would be more to the purpose, from that point of view, to select the form of a fish after which to fashion the bow of a vessel than nature's "wave-line glacial cutwater." And yet it is not wholly undeserving of notice, that the heads of fishes are not in any instance, to my knowledge, moulded with hollow lines, although a prolongation of the snout, in a few cases, may present a short filled-up inward angle at the juncture with the head.

I have adverted to the subordination of principles to circumstances, to which the *ultras* of all opinions are ever inclined to demur, except in cases special to themselves. Now, if any gentleman can show that there is more to be gained in matters of importance by the violation of principle, in choosing hollow lines in preference to straight lines, than there is by an adherence to it—and I do not say the thing is impossible—I will at once give up the point in dispute; for, though I admit the influence of principles according to measure, I disclaim the advocacy of any action therefrom absolute and without restraint, as being an exhibition of tyranny in the government of thought. But I must say, that at present the *onus* is on the other side, and that I am not bound to bring forward "other proofs," and "something better than" I have "hitherto done." However, I will think of it; perhaps a geometrical construction would be more convincing.

I cannot conclude without a few words on the "glacial wave-line cutwater." Mr. Young asks, in reference to my explanation of the mode in which a current operates to produce hollow lines, in this ice-formed exemplar for the bow of a ship—"What more can be wanted by way of proof that here we have the form of least resistance?" The least resistance—of what kind?—as involving least destructive action, or least mechanical action? By simply raising this destruction we arrive almost at once at a solution of the difficulty, but which did not more readily occur to Dr. Thomas Young, although a very practically-minded philosopher, than it has done to Mr. Chas. F. T. Young. I have already admitted the first alternative, but have contested the second, which comprises the real point in dispute—the comparative expenditure of power as depending on form. But is the distinction valid? Does not the first-mentioned action follow as a consequence for the second? Certainly; but the second action is not necessarily less because the other is less, and this is the gist of the point in dispute; for there are conditions on which the effect depends existing in the one case which do not exist in the other. Imagine the cutwater to be of adamant, and the effect vanishes altogether, and along with it the proportionality of its mechanical cause. But, suppose the materials of the cutwater to remain the same, and to vary only in form, still there is no proportionality between the mechanical action, the cause, and the destructive action—the effect. The same elements of strength, simply by a different arrangement of them, may be made to withstand a force which otherwise would overpower them; and this increase of efficiency, by the very fact, negatives rather than necessitates the conclusion that the assailing force must have been virtually lessened by such change of form, in consequence of being deprived thereby of some advantage in the attack. On the contrary, the fact might be quite consistent with the force being greatly increased on account of it; and this happens to be the case. Less resistance, of a kind involving destruction in detail, is perfectly compatible with a greater resistance being required to oppose a movement in the mass. Even in a case where the resistance is of the same kind; where, for instance, a given weight of materials is arranged in the form of a hollow cylinder instead of a solid one, a greater strength might be gained in this way, although a greater strain should be brought upon the cylinder through the extension, within limits, of the length also in the alteration of the form. A favourable balance in the profit and loss account on the side of durability in the cutwater is much more likely where the effects produced, instead of being homogeneous, concern things so diverse in nature as attrition and inertia. The admission, therefore, of either of the above alternatives does not establish the other, and accordingly, a vessel with hollow lines, although exposed to less abrasion, if that were anything worth caring about, might only all the more have to contend with resistance of a retarding kind; whether she actually would or not, depends on another independent line of argument, which I have heretofore gone over. I am only showing now, that less destructive resistance does not necessarily imply less mechanical resistance.

Yours, &c.,
BENJ. CHEVERTON.
Sept. 15.

PROTECTING SHIPS' SCREWS.

TO THE EDITOR OF "THE MECHANICS' MAGAZINE."

Sir,—With reference to the notices which you have been so kind as to make of my Screw Protectors, I beg to communicate to you what must be considered very interesting information on this subject. It is believed that the suspension of the propelling power of the Confederate Steam Ram "Arkansas," and which finally led to her destruction, was owing to the Federals having led her amongst warps purposely laid out to entrap her, and which, being taken up by her screw, soon rendered her motionless. In that helpless state she drifted on shore, and the *finale* we have clearly stated in the public papers. To prevent her getting into the hands of the enemy, a slow match and train to the magazine were arranged; the crew left the ship; and in a few minutes this hitherto impregnable ship was blown to pieces! Here was a powerful engine of war, that had caused the greatest consternation amongst the Federal squadron—a few days before defying the heaviest cannon that could be brought to bear upon her from ten times her own force, and indeed holding triumphant sway, *so long as the propelling power of her screw was in existence.* Mark this: but when that vital part was touched—by what?—not by a powerful Armstrong or Whitworth butt—not by any costly engine of war of that description—but by a few fathoms of (rope!) this dreaded monster becomes helplessly disabled, and falls an easy prey to her enemies! Now this is very striking, and cannot fail to suggest anxious considerations regarding our own costly ships of war. The same efficient means used in the disabling of the "Arkansas" can be used in a far more extensive and deadly manner than I am persuaded is generally supposed. I have already designed most comprehensive arrangements, whereby I have no question in my own mind, approaches to harbours can be protected against the passage of screw war-ships most completely; that is, provided the screw remains in its present unprotected condition. There is no provision at present to protect the screw against hawsers and warps. It is true that an impression is entertained by many naval officers, that the velocity and power of a screw propeller are such as to enable it to cut through any impediment in the shape of hawsers. A plan has also been suggested to extend the cutting power of the screw, by bringing it close up to the stern port, and forming the foremost edge of the screw into a scissor-like shape, so as to make it act as a shear to cut through hawsers, &c., and to assist this effect by doing away with the after beams, to enable the screw to clear itself of the severed parts of the hawser. I cannot help believing, however, that it is unwise to depend on such means to protect the screw from fouling, and I have my doubts, too, that

this will have any effect at all under certain circumstances. In the first place, to obtain the necessary cutting power that is to sever a hawser of large size, say a seven or eight-inch hawser, the s rew must have at the moment considerable velocity. That supposing the ship should have slackened her speed, or at the moment that the hawser fouled the screw she had only commenced to turn a-head, the screw, of course, moving very slowly, then I believe it admits of great doubt if the screw would succeed in cutting a hawser of any considerable size. Dealing also with chain. It would not be difficult to employ this for purposely fouling the screw of an adversary, and in that case I have my further doubts of the efficiency of their cutting arrangements. In smaller vessels, too, such as gun-boats, where the cutting energies of the screw would be more feeble than in larger ships, it may be questioned if this means for clearing the screw could be depended upon. A particular kind of screw must also be employed. A propeller of the Griffith description would surely not do.

I maintain, therefore, that the most efficient and reliable way of dealing with the subject, is to provide means for preventing hawsers or warps getting to the screw at all; and, until ships of war are provided with means for accomplishing this object, they are in a delutive condition to meet the casualties incidental to modern warfare. Now, I maintain, that the simple and inexpensive means which I have produced fully provide for the desired want. My hawser-guards bid entire defiance to hawsers, warps, &c., encountered in the manner they would be in warlike operations. It is impossible to foul the screw with my guards. This has been most decidedly proved by the experiments I have made at Portsmouth; and with this immense addition to the defensive powers of the screw war ship, is also the striking feature in my invention, that the protectors, when not required for use, do not in any way affect the efficiency of the ship with reference to speed and steering powers. Indeed, even when the protector is down, it offers very little impediment to the ship's progress through the water. The radius bars being made of flat iron, oppose a very thin edge to the water, and the guard-chains offer a very slight resistance. I believe that in a frigate of the Shannon class her speed would not be diminished a knot and a-half by the application of the protector, and there would be little or no influence exerted in the steering powers of the ship. I beg also to allude to the extreme simplicity of my invention. It can be applied to a ship in a few hours, and, if need be, taken off in half-an-hour. The experiments which I have lately made in regard to towing ships have also been very satisfactory. Our ships of war are frequently employed on this service, and it is always one of anxiety; for the least slackening of the towing hawser renders it liable to be taken up by the screw. I find, however, that my guards effectually prevent this, and a captain would be able to perform this service with much greater confidence, and even ability, than can be done at present.

I am strongly impressed with the belief that the subject I have taken up is one of the deepest interest to modern navies. Until the screw propellers of ships of war have protective provisions against hawsers, warps, &c., they are not, as I have before said, in an efficient condition to meet the casualties to which they may be exposed. Perfect as their artillery may be—impervious as their sides may be—costly and perfect as all their provisions of war are, still there is that vital part—the screw—at present unprotected and apparently uncared for; and which, at once neutralizes the value of all other power. The disabled and lost "Arkansas" reads us a lesson it would be wise not to lose sight of. We cannot tell what services our ships might be employed upon in the event of another war. We saw during the Russian campaign that men-of-war frequently went up rivers and other confined waters, admirably adapted for using screw-fouling means against an enemy; and it has often been a marvel to me that, with all the ingenious contrivances provided by the Russians for crippling our ships, they had never thought of, or at least tried, means for fouling the screws. The story of the "Arkansas" will, however, suggest the employment of such means for the future.

I must ask leave to be permitted to address you again on this and some other kindred subjects, and

I remain, Yours obediently,

H. D. P. CUNNINGHAM.

Bury House, near Gosport, 10th Sept., 1862.

During the past week the number of 15 wrecks was reported, making a total for the present year of 1,193.

Correspondence.

[We do not hold ourselves responsible for the opinions of our Correspondents.]

EXPLOSIVE BULLETS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Sir,—In the "Scientific American" of the 6th inst. there is a letter on explosive bullets being used by Southern Americans in the present unhappy war, and the editor's note on it is as follows:—"Explosive bullets are old and well-known, but for some reason, probably owing to their expense, our Government has not used them. They were used in the Chinese war to set fire to ammunition trains."

I enclose the letter of Gen. Sir Richard Airey, which was embodied in my memorial to H.R.H. the Commander-in-Chief, proving that I invented the rifle explosive shell as far back as the year 1823, and also the report of the select committee at Woolwich, dated September 4, 1826.

I am, &c.,

International Hotel, J. NORTON.
Bray-street, Wicklow,
September 15th, 1862.

The following is the report referred to:—

Office of Ordnance,
Sept. 4th, 1826.

Sir,—I am directed by the Master-General to acquaint you that the Select Committee convened for the trial of the rifle shell of your invention, have reported their opinion that these shells, although they would probably fulfil your expectations of exploding the powder contained in tumbrils or carriages, could not with advantage be introduced into the service as part of the ammunition of Rifle Corps.

I have the honour to be, Sir,
Your obedient servant,
Captain Norton. FITZROY SOMERSET.

TO CORRESPONDENTS.

Received—W. de St. C., T. L. and Son, J. C. and Co., W. C. P., E. B., Capt. N., Capt. S., I. H. D. W. T. T., N. W., J. R., W. T., W. P., An Aspirant.

GOSSIP.

The French Minister of Marine has just issued a circular recommending the captains of merchantmen to protect their vessels with lightning conductors.

The project for establishing steam communication between Australia and England *via* the Cape of Good Hope, is gradually assuming shape.

Workmen have commenced to erect the new railway station at North Shields, for the Tynemouth branch of the Blythe and Tyne railway. It will be close to the House of Correction, and adjoin the turnpike road, and will be much more convenient for the North Shield people than the present station.

Admiralty orders have been received at Chatham dockyard for eight new vessels of war of various rates and tonnage, from a 4-gun vessel up to a 91-gun line-of-battle ship, to be built at this dockyard as soon as vacancies arise on the several building slips.

At the inquest of the death of a lady in the Crystal Palace branch of the London and Brighton Railway, Mr. Humphreys, the coroner, said, in his summing up, what the public had reason to complain of was that, whether the driver of the pilot engine had authority, or had not, to start without permission, he was enabled to enter on the main up line without any mechanical check whatever. If the traffic on the line were so enormous that it was impossible to give time for a passenger train to enter the London station before empty carriages were brought out to be shunted, some means ought to be devised which would prevent the driver of a pilot engine from entering on the main up line without the permission of the signalman. It appeared to him that, under the existing system, a miscalculation in time to the extent of half a minute, or a miscalculation in the pressure of steam to the amount of half an ounce, might be the means of carrying the driver of a pilot engine beyond the point, and so jeopardize the lives of a train full of people. It would seem that in their shunting arrangements the company, to use a homely but expressive phrase, sailed a little too close to the wind. If they did not wish to change the system they must only take the consequences.

A monster album, manufactured by M. Rollinger, of Vienna, originally intended to receive the autographs of all distinguished visitors to the Exhibition, has been offered to, and accepted by, the corporation of the city of London. The album is six feet long, three and a-half feet wide, and about eight inches thick. In the centre of the upper corner are the City arms, and in metal panels at each side are engraved the emblematic rose, thistle, and shamrock. Other panels are formed of mosaic leather, arranged with great taste, and with a marvellous amount of care. The inside of the book is lined with a rich moiré silk, every page has a border of rich gold and delicately-coloured ornamentation, and the weight of the book is upwards of 700 lbs.

On Thursday week, a new park was opened at Glasgow, on the south side of the river. The Park, which is named after her Majesty the Queen, comprehends a superficial area of 143 acres, although only about 60 acres have been put in proper order.

The railway from Fribourg to Lausanne, in France, has just been opened. The most remarkable feature of this line is, the lofty viaduct of Grandley, made of iron from the foundry of Creusott, which crosses th same at a height of 78 metres from the water and is 333 metres in length.

An Edinburgh paper says:—"A somewhat unusual incident occur ed on Wednesday in the neighbourhood of Croy station, on the Edinburgh and Glasgow Railway. A number of workmen were engaged boring for minerals, and when they reached the coal seam a stream of gas issued from the bore, which, on being lighted, burned to a height of nearly nine feet. The supply of gas was so abundant that it continued burning throughout the day."

"The common experiment," says the *American Journal of Science* "of pouring iron filings into water slowly boiling into smooth glass vessels to increase the ebullition, can be instructively varied by substituting powdered ice or granular snow for the iron filings. Snow that has thawed partially and then frozen, so as to become hard and granular, is the best; but powdered ice will answer, if kept so cold by freezing mixture as to be perfectly dry. If a spoonful of this ice or snow be thrown into a smooth flask nearly filled with water slowly boiling, intense ebullition at once takes place, a portion of the water being thrown out of the flask. The particles of ice thus act like particles of iron or sand, before they have time to melt and set free the steam."

The iron trade of South Staffordshire continues to present increased activity. At several works orders for certain kinds of iron are declined at the prices previously accepted, and most of the works are now in full operation. For ordinary merchant bars there is not an active demand, but the price is firmer. Pig iron is decidedly dearer, and a good many sales have been effected at an advance of 2s. 6d. per ton on the price paid at the beginning of the present or the end of the last quarter. Best native hot-blast brands are at £3 5s. to £3 7s. 6d.; cinder iron, £2 12s. 6d., with a gradual range between these prices. The attendance at the meetings last week was good, and the manufacturers were in better spirits, though the advance in pigs, without a corresponding increase in manufactured iron, was considered to be perplexing. Scotch pigs maintain the advance, the price yesterday being 55s. 6d. cash.

The forthcoming meeting of the British Association for the Advancement of Science, at Cambridge, promises to be a prosperous one. The first general meeting will be held in the town hall on Wednesday, Oct. 1, at eight p.m., when William Fairbairn, Esq., LL.D., F.R.S, will resign the chair, and Professor Willis will resume the presidency, and deliver an address. The various sections will assemble in the rooms appointed for them, for the reading and discussion of reports and other communications, on Thursday, Friday, Saturday, Monday, and Tuesday, Oct. 2 to 7, at eleven a.m.

It is said that the contractors of the Rome-Naples railway continue to urge on the Vatican the great advantage of bringing the two cities within eight hours of each other, but without success.

The Newcastle monument to George Stephenson, our great engineer, is completed, and will shortly be inaugurated. It has been erected in Neville-street, and consists of a massive stone pedestal, bearing a colossal statue of George Stephenson, by Lough, together with certain emblematical figures, viz., that of a blacksmith, naked to the waist, sitting and leaning against an anvil, while his right hand grasps a hammer; a pitman carrying a "Geordie" lamp; a platelayer holding a model of Mr. Stephenson's old fith-bellied rail; and an engine-driver leaning against a locomotive. The monument to the late Robert Stephenson will be placed nearer to the railway station.

Mr. George Bourn says:—"The remarks of Dr. Robert Angus Smith, at page 150, of Sept. 5, quite accord with my ideas of explosion with

paraffin, &c. If I wished to cause an explosion, I should get two cans, one empty and the other full, and put a large funnel in the empty one, then place a lighted candle a few inches above the nozzle of the empty one, at the side of the funnel, and then pour from the one into the other; by so doing, the air and gas would be driven out against the flame of the candle, and if there were no explosion, I should be quite disappointed. If such an experiment were tried in a room, I am strongly inclined to think there would be a *double* explosion."

The second annual meeting of the Miner's Association of Cornwall and Devonshire, will be held at Falmouth on the 24th day of September, in the Council room of the Royal Cornwall Polytechnic Society, when papers connected with the subject of mining, during the operations of the Association will be read.

On Thursday next, Messrs. R. Steel and Son, of Greenock, launched from their building yard a vessel of 480 tons o. m., for Messrs. Charles Saunders and Co., Liverpool. Her dimensions are—150 feet length of keel, and 16 feet 9 inches deep.

On Monday last, the contractors commenced operations in Old-street-road, St. Luke's, in connexion with the great Middle Level Sewer through Shoreditch, which will come out at Old-street. In the High-street a connexion is being made simultaneously with the main line of sewer from Bethnal-green, so as to continue the system through Old-street, *via* Wilderness-row and Clerkenwell to Bloomsbury, where it will unite with the western main drainage at Oxford-street. The works at the East London end present some formidable engineering difficulties.

Messrs Samuda, of Blackwall, are now busily engaged in the construction of floating-docks, iron steam-vessels, &c., for the Peruvian Government, with a view to the more complete navigation of the river Amazon, and to develope the resources of the vast region on the Atlantic side of the Andes.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the Proprietors of this Magazine. Other Papers are hereby warned not to produce them without an acknowledgement:—

STEAM ENGINES, &c., 546.
BOILERS AND THEIR FURNACES, &c., 570.
ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 573.
SHIPS AND BOATS, including their fittings, 545, 552.
CULTIVATION OF THE SOIL, including agricultural and horticultural implements and machines, 565, 587, 598.
FOOD AND BEVERAGES, including apparatus for preparing food for men and animals, *None.*
FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 548, 563, 576, 580, 584, 590, 590.
BUILDINGS AND BUILDING MATERIALS, including sewers, drain-pipes, brick and tile machines, &c., 539, 542, 566, 592.
LIGHTING, HEATING, AND VENTILATING, 544, 555, 571, 577, 578.
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 540, 541, 549, 551, 554, 556, 558, 567, 568, 569, 588, 591, 593, 597, 599, 606.
METALS, including apparatus for their manufacture, 557, 561, 575, 581, 585.
CHEMISTRY AND PHOTOGRAPHY, &c., 564, 574.
ELECTRICAL APPARATUS, &c., 538, 562, 594.
WARFARE, &c., 572, 589, 595.
LETTER-PRESS PRINTING, &c., 582.
MISCELLANEOUS, 536, 537, 543, 547, 550, 553, 559, 560, 579, 583, 586.

536. W. SMITH. *Improvements in the method of making cigarettes, and in the apparatus and materials to be employed therein.* (A communication). Dated Feb. 27, 1862.

Instead of employing cigarette paper folded and inserted inside the cylinder, the patentee prepares sheets of the paper, or other material of the requisite size, and forms books of them by placing them one in advance of the other. He then gums a broad part forming the overlapping pieces, thus securing one edge of each sheet to the next. When it is required to make a cigarette, a sheet of this paper, having on one of its edges a strip of gum, is placed around the outside of the cylinder, and upon the edge being moistened it adheres and forms a tube or case. The tobacco is then charged into the cylinder in the ordinary way, and the end of the paper tube extending beyond the cylinder being secured, the rammer is used to force the tobacco into the cigarette case or tube. The cigarette is then completed. The apparatus is provided with an external leathern or other case, which may be made to contain the paper, tobacco, fusees, and the machine. *Patent completed.*

537. J. TANGYE. *An improvement or improvements in hydraulic lifting jacks.* Dated Feb. 27, 1862.

This invention is not described apart from the drawings. *Patent completed.*

538. Sir C. T. BRIGHT. *Improvements in electric telegraphs and in apparatus connected therewith and employed in the manufacture thereof.* Dated Feb. 27, 1862.

This invention will be specially noticed in a future number. *Patent completed.*

539. T. BRAY. *Improvements in ornamenting wood in imitation of inlaid work.* Dated Feb. 27, 1862.

For the purpose of this invention, the patentee proceeds as follows:—He coats the surfaces to be ornamented, which should be of white or light-coloured wood, with a glutinous matter; after the glutinous coat is dry, he applies to the parts of the surface, which are to appear as white or light-coloured, a spirituous preparation of gums and other materials. The desired pattern or design having been traced on the surface, in this preparation, and the preparation applied being dry, he stains the whole surface with a water stain. *Patent completed.*

540. R. SEAGER. *Improvements in the manufacture of boots and shoes, and in apparatus employed therein.* Dated Feb. 29, 1862.

This invention consists in first producing a sole, or a sole with a heel, and then fastening the same to the upper, by which much less skilled labour is required than heretofore. For these purposes, when making a sole to which no heel is applied, or a sole with a heel thereon, suitable moulds are employed, within which the materials used are pressed into the desired forms. When leather is used, if only in one piece, the same is cut by a cutter into the proper shape; the leather is then moistened, and placed in a mould, and is subjected to considerable pressure therein, by which the leather will not only be rendered compact, and its grain rendered close, but the inner, as well as the outer surface, including the edges, will be made most accurately to the desired form. *Patent abandoned.*

541. T. R. FOSTER. *Improvements in the manufacture of bullion fringe or cord.* Dated Feb. 27,1862.

Hitherto, the bullion fringes or cords for cornices and furniture have been ordinarily manufactured by merely twisting the materials of which they are composed. Now, this invention consists in first weaving the materials into a fabric, and afterwards twisting the fabric, so woven, in order to form bullion fringes or cords. *Patent completed.*

542. W. S. WOOD. *Improvements in valves for regulating the flow of steam, water, or other liquids, and in means or apparatus for working or actuating them direct from the governor, or when worked by expansion cams in connection therewith.* Dated Feb. 27, 1862.

This invention consists of a duplex disc valve, or double disc valve with suitable openings or perforations therein, mounted upon a spindle passing through a stuffing box in a box or casing suitably formed with inlet and outlet ports, and arrangements for connecting the same to, or between, the conducting pipes. This duplex disc valve is placed between two disc seats, faces, or surfaces, one, or both, of which are capable of adjustment to obtain proper jointing or fitting thereof to the faces of the valve. Steam, water, or other fluids may be admitted, either between the two discs or faces of the valve, and pass through the openings thereof, and of the seats, when such openings are placed opposite to each other; or such fluids may be admitted, and pass through the openings of the seats, and thence through the openings of the valve. The valve is caused to turn upon its axis by means of a lever fixed on the spindle thereof, and actuated by the governor, thereby opening or closing the apertures of the valve and seatings. *Patent completed.*

543. J. REVELL. *Improvements in oil cans.* Dated Feb. 27, 1862.

This invention consists in the construction of improved oil cans, in which screws, corks, or other parts hitherto connected with the feeding portion of the can, are dispensed with, unless desired for the purpose of removal when cleansing the interior of the cans. These improved oil cans are made of any required shape, and they each consist of two main divisions, one the upper part, or air chamber, and the other the lower part, or chamber for containing the oil. The upper part is separated from the lower by a partition in the body of the can, and contains the air which passes through a feeding tube, fixed to the partition, and extends to nearly the bottom of the oil chamber. The delivery tube or spout of the oil can passes from the underside of the partition through, or past the air chamber, and is made of any required length. With these improved oil cans there is no possibility of leakage, and the oil will not escape if the can should, by accident, fall to a horizontal position. *Patent completed.*

544. P. D. AZEMAR. *An improved mechanical arrangement for the winding-up and the setting of the hands of watches by means of the knob of the pendant.* Dated Feb. 28, 1862.

This invention relates to a mechanical arrangement for the winding up and the setting of the hands of watches, by means of the knob of the pendant instead of by a special watch key, thus entirely doing away with the use of this latter, the said arrangement, (called remontoir), forming part of the watch, and being contained with the ordinary movement in the casing of the watch; so that, at the outside, a watch provided with this remontoir offers no difference to an ordinary one, except the pendant knob and a small stud protruding through the rim of the casing. The invention is based on the application, for this purpose, of a three-armed or crutch lever, an endless screw or screws for actuating the minute hand pinion, and the main spring arbor in combination with a Brequet key clickwork, and other suitable parts, in such manner that by turning the knob of the pendant the watch may be wound up without acting on the hands; whereas, by pressing at the same time on a stud protruding through the rim of the watch, the turning of the pendant knob will cause the hands only to move, thus allowing the setting of the same as required. *Patent completed.*

545. W. H. MUNTZ. *Improvements in paddle-wheels.* Dated Feb. 28, 1862.

These improvements apply to the ordinary radial form of paddle-wheel employed for propelling vessels, and consists in affixing the floats of such paddle-wheels to the arms lengthwise, instead of across the face of the wheel as usual, the floats being narrow, and in length about two-thirds of the radius of the wheel. Each arm of the wheel may carry its own float, or the floats may be attached to each alternate arm. Each wheel may be composed of only one set of arms and floats, with their corresponding rim and boss, or of two, three, or more sets of arms, floats, rim and boss, keyed side by side on the shaft, and braced together by diagonal or other tie rods. *Patent completed.*

546. A. W. MAKINSON and W. F. BATHO. *Improvements in locomotive engines.* Dated Feb. 28, 1862.

The objects of this invention are to reduce the oscillatory motion which occurs in locomotive engines of the ordinary construction when running at speed; to reduce in number and simplify the working parts of the engine; and to reduce the friction and resistances to onward motion. To effect these objects, and to adapt the engine to the requirements of actual traffic, the patentees construct the engine with one cylinder only, which they place in the mid-section of the engine, the piston-rod, cross-head, and half the weight of the connecting rod by weights, having a reciprocating motion in an opposite direction to that of those parts; and they enable the driver of the engine readily to start it at whatever part of the stroke the piston may be. *Patent completed.*

547. J. C. RATLIFF. *Improvements in the covers for bindings for books and blotting cases.* Dated Feb. 28, 1862.

This invention consists in making the covers or bindings of books, ornamented by the use of woven figured fabrics, either of silk, cotton, wool, hair, or other fibrous material. *Patent completed.*

548. G. MCKENZIE, W. F. MURRAY, and J. HAMILTON. *Improvements in machinery or apparatus for the manufacture of bobbins or holders for textile materials.* Dated Feb. 28, 1862.

This relates to the arrangement and construction of machinery or apparatus for moulding bobbins from clay, which improvements are based, to a certain extent, upon a previous invention, for which Letters Patent were granted to the said Geo. McKenzie and John Hamilton, bearing date the 26th day of November, 1860. According to the present invention, the dod or cylindrical piece of clay to form the bobbin is first made by pressing the clay through an aperture of the proper diameter, and is then moulded by means of four moveable dies or moulds, which form the external shape of the bobbin, whilst the tubular aperture through the centre of the bobbin is formed by a self-acting spindle which passes through the dies that form the ends of the bobbin. *Patent abandoned.*

549. J. POLLOCK. *Improvements in apparatus for protecting trousers from mud.* Dated Feb. 28, 1862.

This consists in attaching a shield to the hind portion of the heel of a boot or shoe, whereby the mud which is raised in the act of walking is caught by the under side of the shield, in place of being thrown on to the legs of the trousers. *Patent abandoned.*

550. J. L. CHARCOUCHET. *Improvements in machinery for breaking stone.* Dated Feb. 27, 1862.

This invention consists of a new method of breaking stone by machinery, worked by steam or other motive power. A strong cast-iron frame-work contains, or encloses, a sifting apparatus formed by a series of parallel bars of the shape of prisms, on which the stone to be broken is placed. The sides of the sifting apparatus are firmly bolted to a timber frame, to the longitudinal cross timber of which a powerful hinge is fixed, whereon two moveable anvils work underneath the sifter. These anvils have grooves or channels cut on their faces so as to correspond with the bars of the sifter into which they fit when the anvils are in their uppermost or horizontal position. These anvils are raised to a horizontal position, and lowered alternately to an angle of about 45°, by means of eccentrics, working on a shaft at the top of the cast-iron standards of the machine. From these eccentrics connecting rods descend, one on each side of the machine, and are attached by hooks to the hammers. Above the hinges of the anvils a broad leather or steel band passes over a copper pulley, and is attached to the hinged extremity of the anvils by means of a projection or stop running along the ends of the channels. Two cranks on the same shaft, which works the eccentric, give a vertical reciprocating motion to two connecting rods, at the lower end of each of which a heavy block or hammer is attached. These hammers, aided by guides in the standards, are consequently caused to descend upon the stone placed on the sifters and moveable anvils. The stone is thus broken into pieces, the size of which may be regulated according to the spaces between the bars of the sifters. *Patent completed.*

551. R. A. BROOMAN. *Improvements in the manufacture of hats and bonnets.* (A communication.) Dated Feb. 28, 1862.

This invention consists, first, in making hats with a body of felt, and with the outer covering of silk plush; and, second, in making hats with a body of felt or felted fabric, and with a covering of felt or of felted fabric. *Patent abandoned.*

552. J. PARKER. *An improved mode of applying steam as a motive power for propelling vessels and for other purposes.* Dated Feb. 28, 1862.

The first part of this relates to a previous patent, dated Oct. 2, 1860, and which consists in discharging high-pressure steam into a pipe or tube of uniform diameter, and leading through the bottom of the vessel at or near the stern into the water. The present invention consists in using super-heated steam, of whatever degree of pressure, instead of high-pressure steam in its natural state of saturation. The invention also consists in the construction and combination of the steam jets, and of those parts into which the steam is discharged, and through which the air

is forced into the air-pipe or chamber leading to the water. *Patent completed.*

553. T. Cowburn. *Improvements in apparatus for raising and discharging boiling soap, and for dividing the same into bars when congealed.* Dated March 1, 1862.

These improvements consist in raising boiling soap from the pan in which it has been boiled to the required level by a vessel containing a self-opening and closing valve, to admit and discharge the boiling liquid, which vessel is raised and lowered by a suitable friction-hoisting apparatus, driven by a separate steam-engine or otherwise, and consisting of a paper or other bowel acting on a friction wheel, which is nearly surrounded by a break clip; the barrel for the rope or chain is connected to the friction-wheel, which is brought in contact, or moved out of contact, with the paper or other bowel by a lever. *Patent abandoned.*

554. J. Bradford. *Improvements in washing-machines, for cleansing domestic garments, fibrous materials, and for manufacturing purposes.* Dated March 1, 1862.

Here the patentee uses one or more eccentric or round rollers, and drives them by hand, or steam, or water power, each of which rollers has one or more ribs or projections running longitudinally from end to end, and revolves in an oblong, square, or other suitably shaped washing-tub or vessel, in which vessel he places frames underneath roller or rollers for supporting one or more elastic rollers, between which and the aforesaid round or eccentric roller or rollers the materials to be washed are carried and rubbed by the projections, the elastic roller yielding to the pressure of the round or eccentric roller or rollers, and thereby regulating themselves to the various thicknesses of the fabric acted upon. He also, when required, covers the round or eccentric roller or rollers, or the projections upon them, with india-ruber, or other elastic material, so as to be adapted for various washing purposes, or he makes the rollers entirely of india-rubber. When one round or eccentric washing-roller is used, he works it, when desired, with a foot-treadle and fly-wheel, so as to leave the hands of the operator at liberty. He also places in the washing-tub or vessel a cage or perforated box, and traverses it to and fro from one end to the other, in order to supply the fabric or material to the elastic rollers, and receive it from them. *Patent completed.*

555. J. Sim. *Improvements in the construction of gas-meters.* Dated March 1, 1862.

This relates to certain improvements applicable to the construction of wet gas-meters, the principle upon which it is chiefly founded being that of causing the gas to pass over or come in contact with an extended surface of water in a separate vessel or vessels, whereby it takes up and absorbs, or becomes saturated with, moisture previous to being admitted into the measuring compartment of the meter, and thus preventing the absorption of the water contained therein by the gas, as is the case when the latter is introduced in a dry state, the effect of such absorption necessarily being to alter the level of the water contained in the measuring compartment. The water contained in the separate vessel or vessels is also constantly evaporating, the results of such evaporation passing upwards into the measuring compartment, and thus assisting in preserving the water level therein. *Patent completed.*

556. H. C. Muller. *Improvements in the manufacture of imitation bearskin caps.* Dated March 1, 1862.

The inventor takes racoon skins, and dyes them jet black to the roots, then shapes the skin and forms the imitation bearskin cap of any suitable shape, with the skin so disposed and arranged that the hair in its natural position inclines or stands upwards. He now treats the skin with a strong solution of linseed water, combing and brushing it well, and training the hair in the reverse direction to its natural inclination, causing it to fall down and stand straight out from the cap, which presents the appearance of the real bearskin cap. *Patent abandoned.*

557. M. Dodds. *Improvements in machinery for moulding, forming, or shaping articles of iron or other malleable metals, and for shearing or cutting such metals.* Dated March 1, 1862.

This has reference to a previous invention patented, dated 8th August, 1860, according to which invention the machines for moulding, shaping, or forming articles of iron and other metals, are provided with a pair of rolls, and the axes of the rolls carrying the swages are geared together by means of toothed wheels fixed upon their ends. In order that the swages or operating parts mounted upon these rolls may act with precision, the patentee causes the axes of the rolls, in place of being geared together by toothed wheels, to be each provided with a crank, and those two cranks to be connected by rods with a parallel or other suitable motion, operated by a driving axis or other motive power, to give a partial rotary motion to each of such axes; by which means, whenever motion is given to one axis, motion will also be simultaneously given to the other, so as to ensure the operating surfaces of the swages acting in unison. There are other features included. *Patent completed.*

558. R. H. Boyer. *Improvements in the manufacture of of boots and shoes.* Dated March 1, 1862.

This invention refers to the manufacture of half or ankle boots and shoes, and consists in making the uppers entirely without seam, as hereafter explained. The invention takes a piece of leather of a size suitable for the intended boot or shoe, and renders it supple by soaking in water or other suitable liquid. He then removes it from the water, and while still wet, by means of a forked lever, presses it into contact with every part, except the bottom or sole, of a last, which is the counterpart of the boot or shoe to be manufactured. He then secures the edges of the leather to the bottom of the last, and when dry, or nearly so, the blocked upper is ready for the reception of the well and sole, which may be applied by pegging or sewing. Springs may be inserted in the uppers, for which purpose incisions must be made to admit them. *Patent abandoned.*

559. P. J. Guyet. *Improvements in taps or valves.* Dated March 1, 1862.

This invention is not described apart from the drawings. *Patent abandoned.*

560. M. and A. Gabriel. *Improvements in the bases of artificial teeth.* Dated March 1, 1862.

Here the inventor forms a compound of india-rubber, sulphur, phospate of lime and soda, in the following proportions: India-rubber 7 parts, sulphur 2, phosphate of lime 2½, soda 2; so as to form a substance that will give a representation of the natural bore, and at the same time resist the action of the acids of the mouth and stomach. The compound is then moulded and hardened by a well-known process, and being adapted and polished after the usual method, the entire piece is submitted to the action of a powerful electro-galvanic battery, for the purpose of depositing a thick coating or envelope of pure gold over the entire base, or in such parts only as may be required by the peculiarities of the case. *Patent abandoned.*

561. S. Hagne. *Improvements in machinery or apparatus for raising hammers and stamping with them hot or cold metals.* Dated March 1, 1862.

The specification of this invention comprises much detail, which we cannot give space to here. *Patent completed.*

562. A. E. Ragon. *Improvements in electrical alarums for telegraphic pressure.* Dated March 1, 1862.

This consists in constructing electric alarums with differential wires, for the purpose of destroying all residuary magnetism, and for rendering the same instrument so delicate and sensitive as to obtain during the transmission of the electric current the maximum of effect of the "line battery." This destruction of the residuary magnetism dispenses altogether in this alarum with the necessity for using any kind of regulating or winding mechanism; at the same time, the adjustment of the alarum is not in any way deranged or affected by the wood stand on which the alarum is mounted and fixed. *Patent completed.*

563. A. Potts. *Improvements in machinery or apparatus for scutching and refining flax, hemp, and other vegetable substances.* Dated March 1, 1862.

This consists in certain novel and improved combinations and arrangements of machinery or apparatus designed for performing the operations of scutching and refining flax, hemp, and other fibrous vegetable substances; and in so constructing the said machinery or apparatus, and combining the several parts thereof together, as to effect the scutching of the fibrous substances—first, by operating on both sides thereof at one time; second, by holding the fibrous substances, suspended during the scutching thereof, and at the same time advancing the said fibrous substances in a horizontal rotary direction; third, in reversing the position of the fibrous substances, or, in other words, causing one part of the machinery to operate upon the exposed parts of the suspended fibrous substances, and then causing another part of the machinery to take hold of the scutched portions of the fibrous substances, and let fall and hold downwards the upper ends of the unscutched parts of the fibrous substances, and afterwards to scutch those parts thereof, and thus to operate upon the whole length of the fibrous substances in one and the same machine. *Patent completed.*

564. P. Robertson. *Improvements in treating yeast, and in the manufacture of ammoniacal salts, and a substitute for animal charcoal.* Dated March 1, 1862.

Here, in order to obtain dry yeast, which may be kept a considerable time without prejudice to its quality, the inventor first separates as much as possible by subjecting the yeast to the action of a centrifugal machine, to pressure, or otherwise, and then finally dries it in a chamber or vessel having shelves or supports, on which are placed trays containing sulphuric acid, chloride of calcium, carbonate of potash, Canadian potash or lime, so as to be surrounded with the shelves or supports having thereon the yeast to be dried. A vacuum is obtained in the chamber or vessel by exhausting pumps or otherwise, and in time the yeast will be completely dried. The yeast is then reduced to powder, and it is then fit for use. The powder may be stored in bottles or other close vessels. In using yeast, in order to manufacture ammoniacal salts and a substitute for animal charcoal, the yeast in a moist state is mixed with clay and carbonate of lime or chalk; the mixture is to be dried and then calcined. —*Patent abandoned.*

565. S. G. Reynolds. *Certain improvements in power-spading machines.* Dated March 1, 1862.

This invention is not described apart from the drawings. *Patent completed.*

566. J. G. Jennings. *Improvements in the construction of chimneys or flues.* Dated March 1, 1862.

This is applicable more especially to chimneys or flues used in connection with open fire-places. In order to prevent the smoke being forced out into the room in which the fire-place is situated by a sudden puff of wind descending the chimney, the patentee enlarges the chimney at a short distance over the fire-place, by building into the brickwork a chamber, made either of earthenware or cast iron, and having both an inlet and outlet passage corresponding in size with that of the flue. He prefers to make this chamber hexagonal, as it appears when in position in front and back view, and with flat ends. The inlet and outlet passages, also, which are generally opposite the one to the other, he prefers to form as sockets to receive the ends of earthenware pipes, of which he usually forms the chimneys or flues. The chamber may be made in one piece, and it is preferred so to make it, but it may be formed in two or more pieces if desired. The use of chambers in this way admits of the use of much smaller chimneys or flues than those usually employed in combination with open fire-places. *Patent completed.*

567. J. B. Kendall. *An improved horse-shoe.* Dated March 1, 1862.

This consists in an improved compound or duplicate horse-shoe, one part of which is secured to the hoof by nails in the ordinary way, and is intended to be removed only when the growth of the hoof renders it necessary, whilst the outer or supplemental shoe is made removeable, and is furnished with calks to prevent the horse from slipping. *Patent completed.*

568. L. Martin and O. Penfold. *An improved candle-lamp.* Dated March 1, 1862.

According to the construction of the ordinary candle-lamp, the heat of the flame and contiguous parts melts the candle more rapidly than is necessary. Now, the object of this invention is to obviate and overcome these disadvantages by the agency of a current or currents of air passing through or among the heated portions of the metal, and thrown upon the upper surface of the candle, whereby the melting of the same is, as it were, regulated or modified, and the due performance of the lamp ensured. *Patent completed.*

569. C. Booldს. *Improvements in fastenings for gloves.* Dated March 1, 1862.

This consists in letting one or more elastic gussets into the wrist of the glove, either in the middle part, the back, or at the side or sides thereof. *Patent abandoned.*

570. J. W. and F. Davis. *Improvements in apparatus for supplying feed-water to steam boilers.* Dated March 1, 1862.

This consists in an arrangement of pipes and valves for supplying the boiler with water. A self-acting steam valve is placed on the top of the boiler, and is actuated by means of a float supported on the surface of the water therein. As the level of the water in the boiler descends, the float actuates a lever in connection with the valve, and raises the same, whereby steam is admitted into the water supply reservoir, and the water therein is expelled into the boiler. *Patent completed.*

571. H. Bowen. *Improvements in gas meters.* Dated March 1, 1862.

This relates to the system or mode of maintaining the proper water level in wet gas meters, by compensating for the evaporation or other loss of water in the meter, and comprises much detail which we cannot quote here. *Patent completed.*

572. R. Shaw. *Facilitating the loading or charging of guns, rifles, fowling-pieces, or other firearms, by a more convenient way of placing the ramrod in position.* Dated March 3, 1862.

This consists in holding the ramrod in its place with the the larger or heavy end near to the stock of the firearm, thereby facilitating the loading or charging thereof. A convenient mode of performing the invention is by attaching a socket, provided with a spring to the stock, and another socket at the end of the barrel, and an open clip between the two; the ramrod is thus securely held between the two sockets, and stayed by the middle clip. *Patent abandoned.*

573. P. Remond. *Improvements in double-rim bridle bits.* Dated March 3, 1862.

This invention is not described apart from the drawings. *Patent completed.*

574. J. Bell. *Improvements in apparatus for distilling shale and other bituminous minerals.* Dated March 3, 1862.

In one modification of this apparatus there are two or more furnaces, one of which communicates with a central vertical flue, having formed round it an annular retort chamber, whilst the other furnaces communicate with flues outside of or encircling such retort chambers. A pipe or pipes is, or are provided, to convey away the volatile matters, and valved hoppers are arranged at the top of the retort chamber for the introduction of the minerals. The refuse or waste matters pass off by discharge tubes disposed between the furnaces, the bottom of the retort chamber being funnel-shaped at each place, to guide the matters into the tubes. The bottom mouths of these discharge tubes dip into tanks, which are filled with water to a height sufficient to seal the tubes, and the refuse is removed from the tanks as it accumulates. Fresh minerals may be applied gradually or at short intervals, and the process may be carried on continuously or nearly so. *Patent abandoned.*

575. A. and J. Sheldon. *An improvement or improvements in smelting furnaces.* Dated March 3, 1862.

Here the inventors have constructed a smelting furnace, in which there are two flues passing from the body of the furnace into the chimney or stack; in one of the said flues, being that contiguous to the smelting chamber, there is a damper conveniently situated, which can be lowered or transposed preparatory to or during the smelting process, which more effectually confines the spelter to the smelting bed or chamber, until the "yellow metal" is in a condition to be removed therefrom. Near the centre of the furnace, and inside it, there is another damper contiguous to the other flue before-mentioned, by means of which the smoke is released and regulated. *Patent abandoned.*

576. J. Schofield. *Improvements in looms for weaving.* Dated March 3, 1862.

This relates to means for letting off or delivering the warp from the warp beam as the weaving proceeds, and consists in applying and arranging apparatus so as to maintain uniformity of tension on the warp threads, and only to let off, deliver, or supply the said warp as it is taken up or drawn forwards by the introduction into the shed of the weft threads, and by the beat-up of the lay or batten. *Patent completed.*

577. A. Tevendale. *Improvements in the apparatus used in connection with cooking stoves and domestic fire-places for the manufacture and supply of gas.* Dated March 3, 1862.

Here the inventor distils coal or cannel, but he prefers common coal mixed with a small quantity of lime or oxide of iron, in an ordinary retort, and places the said retort in such a position that the waste heat from cooking stoves or domestic fire-places shall be economised for heating the said retort, providing suitable dampers, so that the waste heat may only act on the retort when desired. From the retort he caries a pipe or pipes into a suitable vessel to receive any condensed matter thence direct to the burners. He provides, in addition to the foregoing, a pipe for carrying off the steam and other incombustible gases given off immediately after charging the retort, and for permitting the escape of any extra pressure or surplus when a supply is no longer desired. *Patent abandoned.*

578. T. Zillano. *An improvement in purifying gas.* Dated March 3, 1862.

This consists in the use of oxide of manganese, in combination with lime, and with sawdust, or cocoa-nut refuse, or ground bark, as an auxiliary filtering agent. Or, instead

of sawdust, other ordinary filtering agents may be used in combination with the oxide of manganese and the lime. *Patent completed.*

579. A. BEDBOROUGH. *Improvements in pillar letter boxes and letter bags.* Dated March 3, 1862.

This consists in so constructing bags for the inside of pillar letter-posts that, on the carrier opening the door to take the letters, the bag instantly drops and becomes locked by the springing together and closing of the frame of the bag. *Patent completed.*

580. J. B. A. QUIQUANDON. *Improvements in jacquard machines, and in the pattern cards to be employed herein.* Dated March 3, 1862.

This relates to an improved mode or method of working the pattern cards in jacquard machines, and to a peculiar construction of pattern card, which improved card the inventor calls the "composteur quiquandon," and by the use of which one set of cards may be made to serve for any number of different designs, by suitably adjusting or modifying the same to suit the particular design or pattern to be produced. According to this invention, the series of pattern cards, in lieu of being connected together in the form of an endless well or chain, as heretofore, and, consequently, occupying a considerable amount of unnecessary space, are used separate and detached from each other, one card being placed immediately behind another, in a suitable support or holder in front of the needles. The front card, after having acted upon the ends of the needles, is made to descend, and is deposited by a traversing carriage, or other convenient arrangement of self-acting mechanism, in the rear of the other cards, whilst the second card comes into operation, and is in its turn lowered and placed behind the first, and so on throughout the series. *Patent completed.*

581. G. BISCHOF. *Improvements in treating ores and solutions containing copper and iron, or either of them, to obtain products therefrom.* Dated March 3, 1862.

To the solution to be treated the inventor adds chloride of calcium, or other chloride of an alkaline earth, or of an alkali, which is capable of separating the sulphuric acid from sulphate of copper and sulphate of iron. It will probably, however, in almost every case, be most convenient to use chloride of calcium. In this way he obtains in solution chloride of copper and chloride of iron, or one of these, and a sulphate of an alkaline earth, or alkali, either soluble or otherwise, which is separated. This being done he adds to the solution of metallic chloride, lime, magnesia, or baryta. Lime, or a mixture of lime and magnesia, will, however, be most useful. In this way he obtains a precipitate of oxide of copper and oxide of iron, or one of these. Mixed oxide so obtained may be readily smelted to obtain metallic copper; oxide of copper, if obtained separately, may be similarly treated, or otherwise used as oxide of copper. Oxide of iron, if obtained separately, may be applied to any use to which other precipitated oxide of iron is applicable. *Patent abandoned.*

582. W. CONISBEE. *Improvements in colour-printing machines for letter-press or block printing.* Dated March 13, 1862.

This invention is not described apart from the drawings. *Patent completed.*

583. H. BUNNING. *Improvements in the manufacture of lubricating or compounds.* Dated March 3, 1862.

This consists in combining one or more of those natural mineral oils or matters known as American petroleum, also as rock oil, Cuba rock oil, and rangoon oil, or earth, with vegetable oils or grease, or with both, and with an alkaline solution. *Patent completed.*

584. F. B. HOUGHTON. *Improvements in the manufacture of paper.* Dated March 3, 1862.

This consists in boiling the chaff (which the patentee prefers to be cut longer than heretofore—say from an inch to an inch and a-half) to an extent sufficient to reduce the more fibrous parts to a pulp, having the knots and weeds as little disintegrated as may be, and then, having washed out the alkali, a coarse "knotter" is used, which will allow the disintegrated vegetable matter to pass, whilst the extraneous matters will be arrested. The pulp so obtained will retain its fullest strength and weight, and require the minimum of bleaching material to act upon it. The "knotter" he prefers consists of a plate with square or oblong holes, sufficiently small to impede the passage of the knots and weeds. *Patent completed.*

585. J. GJERS. *A material or sand for the formation of moulds for casting iron and for other like purposes.* Dated March 4, 1862.

The patentee claims the use of furnace slag reduced to the required state of fineness or division (either alone or mixed with natural sand) in the formation of moulds for casting iron or other metals. *Patent completed.*

586. J. ELLIS. *Fastening chains, or any other thing to which it can be attached, and of any dimensions.* Dated March 4, 1862.

This guard is formed to resemble a common chain swivel of any size, but arranged so as to be detached and united by means which cannot accidentally occur. The link resembling that in a common chain swivel, is cut so close to the stem, which works and revolves in the cap, as to barely leave space for the cut point to slide along a rifle groove, first on the outside, and afterwards along the inside of a groove in the cap. A screw ferrule works on the end of the hook and the stem, so as to form a complete link when screwed up close. The head of the hook at the end of the stem, when raised above the cap in order to detach it, comes into contact with the link or fastening to which the cap is suspended. A groove in the head of the hook allows it to pass, so that it may be completely reversed. The point of the hook has then to be guided along the inner groove of the cap, and the hook is thus freed or separated from the swivel cap. *Patent abandoned.*

587. B. STANDEN. *Improvements in the preparation or manufacture of portable manure or fertilizing compound, and in the collection or extraction therefrom of a certain liquid applicable to various purposes, and also in machinery or apparatus to be employed therein.* Dated March 4, 1862.

The aparatus employed for carrying out this invention cannot be described apart from the drawings. *Patent completed.*

588. PHILIPP SCHAFFER and FREDERICK SCHAFFER. *Improvement in travelling bags, portmanteaus, and other similar bags and cases.* Dated March 4, 1862.

The object of the present invention is to prevent access to the contents of the bags, portmanteaus, and other cases by cutting, and the patentees effect this by inserting between the outer leather or other like material, and the lining, metal cloth or wire gauze, or they form the lining itself of such cloth or gauze. They prefer to employ that metal cloth composed of split steel rings. *Patent completed.*

589. COLONEL SMITH. *Improved sight of fire-arms, applicable also as an apparatus for measuring angles.* Dated March 4, 1862.

This sight or apparatus is composed of a tube in which two prisms of equal refractory power, independent of each other, are fitted in such manner that they may be made to revolve through equal angles in opposite directions. *Patent abandoned.*

590. W. TONGUE. *Improvements in machinery for breading, rubbing, and scutching, flax, hemp, or other vegetable fibrous materials, and in processes for treating silk waste.* Dated March 4, 1862.

We cannot here quote the voluminous details of this invention. *Patent completed.*

591. A. J. SEDLEY. *Improvements in metallic bedsteads, sofa bedsteads, and folding chairs or seats.* Dated March 4, 1862.

Here, when constructing a metallic bedstead, the head and foot frames are hinged or connected to the side rails of the bottom frame of the bedstead in the following manner:—The ends of the side rails of the bottom frame are bevelled or inclined, and within a few inches from each end of these side rails one end of a link is attached by a pin joint, the other end of such link being attached also by a pin joint to the lower end of the side rail of the head or foot frame of the bedstead, and the lower end of this rail is also formed to a bevel corresponding to that of the end of the side rail of the bottom frame of the bedstead; so that, when the head and foot frames are set up, the inclined end of each of the side rails of the head and foot frames butts against the inclined end of its side rail, and the links which connect the head and foot frames to the side rails are then horizontal, or nearly so. To fold down the head and foot frames, it is simply required that such head and foot frames should be lifted, when the links will allow of the folding. *Patent completed.*

592. G. A. COTTAM and H. R. COTTAM. *Improvements in horticultural buildings and other glazed structures.* Dated March 4, 1862.

Here the metal rafters, or the sashes or parts to be glazed, are formed with a succession of steps, according to the number of sheets of glass to be used from the top to the bottom; and it is preferred that these steps should be in the forms of groves, so that the succeeding sheets of glass may be slid into their places and overlap at their edges, though a single groove may be used of sufficient depth to receive the thickness of glass one over the other. When walls are used in constructing a building, the rafters are connected therewith by metal plates, in the form of inverted troughs, either extending the whole length of the building, or else at such intervals apart as will suit the distance apart at which the rafters are desired to be attached to the wall. Where required, tie or guage rods or bars are applied, to retain the rafters in position. When using wrought iron sash bars, in order to connect them to the structure or to each other, cast iron sockets are used, which are fixed to the ends or other parts of the sash bars by pins or rivets, or otherwise; and when required such cast sockets are made with branch sockets at a right angle, or such other angle as may suit the angular direction in which it is desired to fix the ends of other sash bars to the primary one to which the socket is fixed. At the surface of the ground, where necessary, a sill or bar is fixed or applied in any convenient way, but it is preferred to use a row of wood posts or stakes, driven into the ground, the parts so driven being well charred. *Patent completed.*

593. T. GREENWOOD. *Improvements in sewing machines.* Dated March 4, 1862.

This relates to an improved form of driver for propelling the shuttle in platform sewing machines, whereby the shuttle is more securely held, and the liability to miss the loop is reduced. In the extremity of the vibrating arm, which communicates motion to the shuttle, a socket is made to receive a pin, which is jointed to and projects laterally from the shuttle driver. By this means, therefore, the vibrating arm and shuttle driver are connected together by a kind of loose musical joint. The driver is formed with two projections, which serve to embrace the shuttle. One of these projections is forked, and embraces the nose of the shuttle, and the other bears against the rear end thereof; and the shuttle, although effectually secured by the driver, will move freely backward and forward in its race. The invention also relates to the arrangement for regulating the presser foot over the feet wheel to suit the work under operation. Instead of attaching to a fixed point the tension spring, which gives the downward pressure to the presser foot on the face of the guide box, in which the vertical needle stem and presser foot stem works, a lever arm is mounted for holding one end of the tension spring. Bearing upon the outer end of this arm is a regulating screw, which is tapped into a lug attached to the guide box. By turning, therefore, this regulating screw the lever arm may be readily caused to increase or diminish the tension of the spring, and thereby put any required pressure upon the presser foot. *Patent abandoned.*

594. G. F. GUY. *Improvements in electro-magnetic motive-power engines.* Dated March 4, 1862.

This relates to a peculiar construction, arrangement, and combination of apparatus for obtaining motive power, by the aid of electro-magnetism, and consists in the use of one or more series of electro magnets arranged in circles, and made to act successively upon a ring of soft iron, which is made to roll over their faces or poles. This ring is connected to the main shaft of the machine by any convenient arrangement of universal joint which permits of its gyrating in all directing in all directions round the shaft, whilst it is at the same time coupled thereto, so as to be incapable of rotating without carrying the shaft round with it. *Patent completed.*

595. J. SIDEBOTTOM. *Improvements in fire-arms and ordnance, and in projectiles.* Dated March 5, 1862.

This consists in an improved mode of constructing the breaks by which the recoil of the barrel is regulated or controlled, as described in the Specification of Letters Patent, granted to the present patentee on the 24th of July, 1861 (No. 1853). According to the present improvement, he makes the break in the form of a wedge, and he applies it in the bearing by which the barrel of the fire-arm or piece ordnance is supported. The improvements in projectiles are applicable to smooth-bored and rifled fire-arms and ordnance, and they consist in making the rear end of the projectiles conical; the front end of the projectile is rather less in diameter than the bore of the barrel, so that it may easily be introduced, either from the muzzle or at the breach. On the conical end of the projectile an annular ring of iron or other metal or material is placed; this ring is either solid, or provided with one or more diagonal grooves, slats, or perforations. When the powder explodes the annular ring is forced up the conical end of the projectile, and in so doing its outer circumference is expanded until it accurately fits the bore of the barrel and the rifle grooves (when the barrel is rifled), thereby preventing windage, and imparting the full force of the powder to the projectile. In some cases the exterior of the annular ring may be made to fit the rifle grooves of the barrel. Another part of the invention consists in constructing projectiles of a series of discs of cast iron or other metal, which discs are held together by a central bolt. These projectiles answer the purpure of grape shot. *Patent completed.*

596. W. TONGUE. *Improvements in machinery for preparing silk, flax, hemp, or other fibrous materials.* Dated March 5, 1862.

This refers to a previous patent, dated 27th Jan., 1859 (No. 249), in which the fibrous material, in its passage from a pair of feed rollers, or screw gill feed apparatus, to a pair of delivering rollers, is operated upon by the teeth of a comb having a reciprocating motion given to it in the direction of the length of the sliver of fibrous material. The first improvement consists in so arranging the moveable or reciprocating comb, as to cause the teeth to be mounted or to pass downwards through spaces or openings in a plate or frame into the sliver of fibrous material, a brush or other instrument being employed to support the sliver when the teeth of the comb are withdrawn. The invention also consists in giving an intermittent movement to the delivery rollers, so that they may be at rest, or nearly so, whilst the teeth of the reciprocating comb are withdrawn from the sliver, and whilst the comb moves backwards to enter the sliver. Another improvement consists in causing a series of points to enter the sliver, and arranged in combination with the brush or other depositing instrument, in order to hold the fibres and prevent the derangement thereof during the backward movement of the reciprocating comb or combs. There are various other features included. *Patent completed.*

597. J. SOMERVELL, R. M. SOMERVELL, and M. BLANC. *Certain improvements in the manufacture of boots and shoes.* Dated March 5, 1862.

This consists in the manufacture of boots and shoes with soles of walnut, or other suitable wood, an angular groove being cut in the edge of the sole, to which the upper is attached by strong wire nails, or otherwise strong wire staples U-shaped. A piece of leather is then sprigged on to the sole and heel of the boot, or shoe, so as to cover them, and this leather is protected by hobs or other strong nails, tips, or plates. Also in the formation of an imitation welt, by which the heads of the wire nails are entirely hidden. This is accomplished by inserting the nails a short distance from the edge of the upper; the margin of leather thus left is then worked up, and afterwards set. Also in a shaped iron plate, which is screwed on to the waist of the sole in some cases, so as to add to its strength. *Patent completed.*

598. W. KENSMAN and W. KENSMAN, JUN. *Improvements in apparatus for tilling land by steam power.* Dated March 5, 1862.

This consists of a frame or carriage mounted on six wheels—two land and four furrow wheels. To the plough beams, shares and coulters are affixed in pairs on the opposite side, of the beams, which are capable of being lifted and reversed at the end of each course. At the side of the plough there is a sliding rod, connected by chains to draw links, to lay the drag rope in its proper place ready for the return course. The plough beam and coulter have a plain or indented bead, and the coulters are secured to the plough beam by improved adjustable clamps. The improvements in apparatus for transmitting power from the steam engine to the plough consists in a novel mode of lifting the pinions out of gear with the rope drums, and checking the revolutions thereof by a simple lever. *Patent completed.*

599. J. CHUBB and H. M. BURTON. *Improvements in apparatus for displaying or exhibiting jewellery and other valuable articles in glass cases.* Dated March 5, 1862.

Here apparatus is applied below the table, or surface on which the articles are placed, in such manner that the articles may at any time be enclosed in an iron or other suitable metal safes. *Patent completed.*

PROVISIONAL PROTECTIONS.

Dated April 30, 1862.

1278. A. Prince, 4, Trafalgar Square, Charing Cross. A new composition for casting to represent marble. (A communication.)

Dated July 21, 1862.

2074. A. Naudain, West Farms, West Chester, New York; J. Peacock, Morrisania, West Chester, New York; and W. H. Walton, New York. Improvements in looms for weaving all kinds of textile fabrics.

Dated July 31, 1862.

2176. W. E. Newton, 66, Chancery Lane, civil engineer. Improvements in lubricating compounds. (A communication.)

Dated August 12, 1862.

2252. J. Ramsbottom and G. Hacking, Accrington, Machinists. Improvements in machinery or apparatus for measuring and registering the flow of water and other fluids.

Dated August 13, 1862.

2269. J. R. and F. C. Tussaud, Marylebone Road. Improvements in the treatment of representations formed from wax, or from compositions of wax with other matters.

Dated August 14, 1862.

2286. G. White, Torquay, plumber; F. Buckland, Newton Abbott, auctioneer; and C. Rees, Newton Bushel, accountant. Improvements in the manufacture of water-closets.

Dated August 15, 1862.

2300. A. Shepard, 55, Victoria Street, Westminster. Improvements in obtaining light and in apparatus connected therewith.

2304. J. Carter, power loom regulator, and J. Maher, manager, Victoria Mills, Lockwood, near Huddersfield. An improvement in the construction of power looms.

Dated August 25, 1862.

2361. M. J. Haines, 4, Victoria Road Rope Walk, Bristol. Improvements in the manufacture of driving bands or straps.

Dated August 26, 1862.

2366. T. Richardson, Newcastle-upon-Tyne, Chemist, and R. Allison, accountant, Moorgate Street, City. Improvements in the manufacture or treatment of articles of steel, and in the apparatus employed therein.

Dated August 28, 1862.

2388. G. Biddle, Birmingham, brush maker. Improvement or improvements in the manufacture of brooms.

2390. E. Lachenal, Little James Street, Bedford Row. Improvements in gas meters. (A communication).

2392. G. Cooke, Mornington Crescent, Hampstead Road. Improved apparatus for securing or fastening doors to prevent robbery or intrusion.

Dated August 29, 1862.

2394. P. L. Guilbaud and N. V. Thiré, Paris, 60, Boulevart de Strasbourg, Practical Engineers. An improved self-inking hand stamp.

2396. F. H. Lefranc, Paris, Gentleman. Improvements in the manufacture of casks.

2398. J. Davis, Liverpool, Merchant. Improvements in the manufacture of spoons, forks, and similar articles. (A communication.)

2400. G. W. Dyson, Tinsley, York, Forge and Mill Manager. Improvements in machinery for finishing and polishing circular metal rods, bars, and shafts, applicable also to the manufacture of metal tubes and pipes.

2404. W. Upfill and W. Morton, Birmingham, Iron Merchants and Manufacturers, and W. Asbury, Engineer. Improvements in the construction of wheels and axletrees for carriages.

Dated August 30, 1862.

2406. E. T. Hughes, 123, Chancery-lane. Improvements in the manufacture of woven fabrics, and in apparatus employed therein. (A communication.)

2408. F. Le Conte, No. 10, Rue des Tarisses, Tournay, Belgium. Improvements in the construction of furnaces for steam boilers used in sugar mills, distilleries, breweries, and other mills or factories.

Dated September 1, 1862.

2414. J. Walker, Glasgow, manufacturing chemist. Improvements in the treatment of kelp, and in the manufacture of products therefrom.

2416. J. Ellis, Old Market Street, Bristol, staymanufacturer. Improvements in corsets.

Dated September 2, 1862.

2424. D. B. Peebles, Edinburgh, engineer. Improvements in wet gas meters.

2426. W. Hunt, Tipton, manufacturing chemist. Improvement or improvements in the manufacture of muriate of ammonia.

2428. R. Glanville, Bermondsey, Engineer. Certain improvements in marine and other engines.

2430. W. Roberts, Millwall. Improvements in apparatus for regulating the amount of water discharged by a pump, chiefly applicable for regulating the amount of water thrown by a steam fire-engine, or for regulating the amount of water fed to a steam boiler.

Dated September 3, 1862.

2434. C. Garton, Bristol, brewer. An improved method o applying heat in the manufacture and refining of sugar and in malting, hop drying, brewing, distilling, and vinegar making.

2438. W. H. Atkinson, Cavendish Club, Regent-street, gentleman. Improvements in studs or fastenings adapted to holding together parts of shirt fronts, wrist-bands, collars, gloves, and other articles of wearing apparel.

2440. E. Dyson, Little Hulton, near Bolton, cotton spinner. Improvements in throstle spinning and doubling machines.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

1278. A. Pnirce. Composition for casting. (A communication.)

1312. T. Snowdon. Manufacture of steel tyres, hoops, and cylinders. (A communication.)

1313. J. M. Heppel. Permanent way.

1314. E. Herdman, A. F. Herdman, and J. Herdman. Manufacture of wrought iron and steel.

1332. C. Binks. Obtaining hydrogen gas and certain gaseous compounds of hydrogen and carbon.

1341. J. Adcock. Measuring and indicating distances.

1345. A. Morel. Heckling machines.

1355. J. E. Ransome, W. Copping, and L. Lansdell. Harrows.

1358. E. Bourdon. Construction of blowing fans.

1359. C. V. de Berville. Safety coupling bar.

1362. T. H. Hopwood. Raising sunken vessels.

1365. J. Johnson and A. Chapman. Preventing collisions.

1372. D. Marchal and A. C. de Wiart. Preventing the destructive effects of vibration or jar on the permanent way of railways, and on the wheels, axle-trees, and other parts of carriages, and the working and other parts of machinery liable to shocks.

1385. L. D. La Peyrouse. Treating neutral and acid, fatty or oily substances, resins, and resinous substances.

1387. G. F. Greiner and J. H. C. Sandilands. Construction of pianofortes.

1389. L. D'Aubreville. Metallic cross-sleepers for railways.

1390. T. K. Mace. Guards or protectors for hats.

1394. T. Fawcett, jun. Plaited fabrics.

1403. W. Clark. Manufacture of felted and other fabrics.

1404. R. Moore. Indicating the presence, position, or accumulation of liquids, gases, and vapours.

1409. J. House. Machinery for crushing or reducing substances.

1412. J. B. Cristofini. Tents.

1415. H. Walker. Handles for crochet-needles, pencils, penholders, and other articles.

1416. J. Milnes. Exercising the human body.

1417. G. Fuhrmann. Melting and boring cast steel barrels.

1424. H. Cartwright. Propelling and steering screw steam vessels.

1425. W. N. Hutchinson. Screw-propelled ships.

1427. H. Ashworth. Opening and carding fibrous substances.

1429. A. B. Freeland. Preparation or treatment of hops.

1431. T. Buckney. Portable "tell-tale" timekeepers.

1432. S. B. Ardrey and S. Beckett. Manufacturing spindles.

1441. R. A. Boyd. Manufacture of bacon.

1443. W. Clark. Generating motion in fluids. (A communication.)

1453. R. A. Brooman. Production of photographic and stereoscopic portraits and pictures.

1461. A. Nicole. Stop watches and time-keepers, and instruments for measuring accurately short intervals of time.

1482. R. Laming. Constructing and using electric telegraphs.

1492. F. Stocken. Carriages.

1494. A. V. Newton. Cutting leather. (A communication.)

1495. A. V. Newton. Cutting boot and shoe soles. (A communication.)

1517. A. V. Newton. Splitting leather. (A communication.)

1519. M. A. F. Mennons. Applying screw power to the locomotion of railway trains on steep inclines. (A communication.)

1576. G. A. Huddart. Superheating steam.

1594. G. H. Daw. Fire-arms.

1624. F. Datichy and E. Sabatier. Making pulp.

1722. A. J. Joyce. Lighting and heating.

1827. B. Fabbricotti. Polishing and grinding belt. (A communication.)

1894. M. A. F. Mennons. Prevention and reduction of synovial and other swellings or tumours in the limbs of horses.

1971. J. M. Gille. Calendar inkstand.

2006. M. A. F. Mennons. Floating batteries. (A communication.)

2077. T. Meriton. Steam engine governors.

2145. Z. Colburn. Steam pumping engines.

2241. T. Holdsworth and J. Crossley. Warping, scouring, sizing, stretching, measuring, cooling, drying, and beaming yarns for weaving.

2331. J. Standish and J. Gooden. Preparation of cotton, wool, flax, or other fibrous materials to be spun.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Dated April 29, 1862.

683. J. and R. Cunningham.
684. J. Hunter.
687. J. Wadsworth.
692. R. A. Brooman.
703. G. H. Birkbeck.
706. L. Gabler and M. Zingler.
747. G. T. Bousfield.
708. A. J. Paterson.
709. M. A. Muir and J. McIlwham.
711. A. and W. Coles.
714. C. N. Kottula.
715. . B. Pettit.
716. J. Smadja.
723. G. Hamilton.
724. J. Robey.
725. W. Pickstone.
726. J. T. and T. Pendlebury.
728. A. S. and A. R. Stocker.
730. W. B. Lord and F. H. Gilbart.
732. W. Bowser.
734. J. and W. Weems.
738. G. T. Bousfield.
739. J. M. Courtauld.
742. W. Gossage.
743. T. Waller.
749. J. Banks.
758. S. Slack.
760. R. A. Brooman.
763. R. Hadfield and J. Shipman.
773. B. Samuelson.
782. D. E. Siebe.
799. R. Gladstone.
831. J. H. Johnson.
859. W. F. Smith and A. Coventry.
876. C. H. Townsend, J. Young, and J. Hankins.
915. H. W. Caslon and G. Fagg.
934. W. Clark.
941. J. Newton.
1044. J. F. Mathias.
1078. G. Fell and W. Haynes.
1109. J. Stanton.
1152. J. Combe.
1245. G. R. Samson.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

1966. B. Baugh.
2015. W. Neilson.
2018. G. Parsons.
2089. W. E. Newton.
2257. J. J. Eagleton.
2036. E. Blake.
2059. J. G. N. Alleyne.
2048. W. Rothwell and T. Watson.
2058. M. M. Jackson.
2106. J. Bottomley and A. H. Martin.
2080. J. Mason.
2593. A. V. Newton.
2158. E. Jones.
2083. A. B. Seithen.
2108. B. Lauth.

PATENTS ON WHICH THE SEVENTH YEAR'S STAMP DUTY HAS BEEN PAID.

1998. W. H. James.
2082. J. G. Martien.
2057. M. Curtis and J. Wain.
2088. D. Zenner.
2111. J. Willis.
2070. J. H. Tuck.
2079. W. F. Thomas.

LIST OF SPECIFICATIONS PUBLISHED

For the Week ending September 13, 1862.

No.	Pr.	No.	Pr.	No.	Pr.	No.	P r	No.	Pr.	No.	Pr.
	s. d.		s. d.		s. d.		s. d·		s. d.		s. d·
273	0 8	286	0 4	299	0 8	312	0 4	325	0 4	338	0 4
274	0 4	287	0 10	300	1 0	313	0 4	326	0 4	339	0 10
275	0 10	288	0 8	301	0 4	314	0 4	327	1 6	340	1 4
276	1 2	289	0 4	302	1 2	315	0 10	328	0 8	341	0 4
277	0 4	290	0 10	303	0 4	316	1 8	329	0 4	342	0 4
278	0 4	291	0 8	304	0 10	317	0 4	330	1 0	343	0 4
279	1 6	292	0 4	305	0 4	318	0 10	331	0 4	344	0 4
280	0 6	293	1 6	306	0 4	319	0 4	332	0 4	345	0 10
281	0 4	294	0 4	307	0 4	320	0 10	333	0 4	346	0 4
282	1 0	295	0 4	308	0 10	321	0 4	334	0 4	347	0 8
283	1 4	296	0 4	309	0 8	322	0 8	335	0 8	348	0 4
284	0 6	297	0 8	310	0 4	323	0 4	336	0 4	349	0 4
285	0 4	298	0 4	311	0 10	324	0 10	337	0 10		

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

The contractors of the Rome-Naples Railway have been very urgent in recommending the Vatican to bring these two cities within eight hours of each other, but their appeals have not been reciprocated.

The tombstone that covered at Longwood the grave of Napoleon I., together with the rusty iron railing that enclosed it, were left at Cherbourg in 1840, when Prince de Joinville landed the coffin out of the "Belle Poule." These memorials are now to be also forwarded for exhibition at Paris, and are to figure in that wing of the Louvre where the saddle, camp bed, writing desk, &c., of the first Bonaparte may be seen.

We have to announce the demise on Monday last of Mr. Charles Pearson, who for many years was the solicitor to the Corporation of the City of London, and the original promoter of the great scheme of the Metropolitan Underground Railway.

CLOSING FRUIT JARS.—For the preservation of all kinds of fruits, use glass bottles or jars. Select those of even thickness, or rather of even thinness, for they are often exposed to considerable heat, and while they should not be so thin as to break in common handling, or burst from internal pressure caused by fermentation, still they should not be thick, or of pressed glass, when blown-glass jars can be readily obtained. So much for the bottles. Now, as to closing them air-tight, we know corks will not do it. The very substance of the structure is against it, unless cork of the most velvety character is obtained, and this is costly. We recommend waxed cloth tied over the jar, as a substitute at once cheap and effective, and have never found anything superior to it. Prepare the cloth in this way:—Melt together some resin, beeswax, and tallow in equal parts; tear the cloth in stripes four inches wide, or, at least, wide enough conveniently to tie over the mouth of the jar, and dip these strips, drawing them through the hot wax and stripping nearly all the wax off. With cloth thus prepared, after the jar is filled with hot preserves, and while still hot, close the mouth and bind it on with good linen cord. Then, with shears, trim off as much of the waxed cloth as is desirable, and then dip it in some melted wax, which should be made with only about half as much tallow. Sealing-wax may be used instead if desired. The jars should be put where the wax will cool at once, so that the exhaustion caused by the cooling of the preserves and the condensation of the steam, may not cause the wax to run through the cloth. Nothing can be more thoroughly air-tight than bottles so prepared.—*Homestead.*

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, SEPTEMBER 26, 1862.

OUR WEEKLY SUMMARY.

WHAT with Horfall guns, Whitworth projectiles, and destructive infernal machines, our iron-cased vessels made and making cannot be said to be invulnerable. The Americans have hitherto been principally famed for constructing infernal machines, but, if report speak truly, a Finlander in the Russian service has invented the best machine of the kind. The apparatus is said to be extremely simple, and to cost but little in construction. It consists of a glass reservoir, which, when filled with powder, will float at a certain depth, and when brought into contact with a ship's bottom will produce disastrous results. Experiments have recently been made with this machine in the royal dockyard at Nyholm. The first experiment shattered the framework of the gunboat, and sent some of its planks to a height of 80 or 100 feet. The second experiment threw up a column of water 100 feet high, and the shock was felt for a considerable distance. We give currency to this report with considerable reserve, as it may have been put in motion by the inventor himself. Inventors, when describing their plans, make their own ducks swans.

The accident at Malvern-hill railway tunnel appears to reflect on the engineering capacity of Mr. Liddell, engineer to the Worcester and Hereford Railway. A correspondent informs us that the principal portion of the tunnel has been bored through hard cyanite rock. On the Worcestershire side there was constructed an air-shaft about 100 yards in the tunnel. This shaft, which was built of brick, rested on the arch of the tunnel, which gave way, carrying the whole of the shaft with it. Luckily, indications of the coming disaster were seen in time for the workmen to get out of the way, and no lives were lost.

The bread-making-by-machinery controversy still continues in a morning contemporary; and, as far as we can judge from the many letters which have been published, Stevens' machine is condemned by most practical bakers. The inventor of that machine gets severely criticised for the manner in which he has caricatured the universal baking trade. Many a baker has stepped forth to vindicate his own establishment and others with which he is acquainted. One correspondent, who had tried Stevens' machine, and Vicars & Co.'s. mixer, speaks highly of the latter. He thinks the only effectual way to give the public pure bread, is for the bread to be manufactured in large quantities by public companies or large capitalists, employing the best machinery, in large, open, and healthy workshops. Then, and not till then, he says, will the baking trade be brought on a level with other manufactures, and the public have a chance of receiving that which they have a right to expect—namely, pure bread. Another correspondent, Edwin Clayton, of Nottingham, gives an account of a bread-making machine which he patented in the first year of William the IV. The machine consisted of a rotary barrel and revolving knives, the motion or action of each being quite independent of each other. The entire materials of the batch of bread are placed within, the lid closed, and the machine worked by two men; and in ten minutes fifty stones of dough may be made ready to lighten, without being touched by hand or seen by eye. A machine made on this principal has been used in Southwell House of Correction for nearly thirty years. The inventor says "that a two-sack machine made on his principle will cost about twelve pounds; and, as "the patent right has long since expired, any-"body may use it." What becomes of the patent rights of the bread-making machines which have adopted this principle of rotary barrel and revolving knives? What becomes of Mr. Steven's patent rights? This controversy on bread-making is an important and interesting one, and we shall return to it.

The wreck register shows a fearful increase of casualities on the British coast for the year 1861. The statistics of the Board of Trade give 1,494 shipwrecks during that year, being a considerable increase upon the number during any of the preceeding nine years, and 260 above the annual average of the last six years. The estimated loss of property on these 1,494 wrecks is upwards of one million; the more serious loss of human life was 884 persons. The question is pertinent—could any precaution have lessened the number of these casualties? The well tabulated returns of the Board of Trade do more than suggest that many of them were preventable. We have applied ourselves, not unsuccessfully, in lengthening the tenure of human life on land, by diminishing those contingencies which increase our bills of mortality. We may not avert the storm or the gale, "man's control stops with the shore," but by proper precaution in providing for danger and wrestling with it when it comes, we may confine disaster and death within the narrowest limits which human efforts can impose upon them. We find that 10 wrecks took place in a perfectly still sea, 14 in light airs, 51 in light breezes, 43 in gentle breezes, 103 in moderate breezes, 171 in fresh breezes, 149 in strong breezes, 66 in moderate gales, 124 in fresh gales, 230 in strong gales, 311 in whole gales, 102 in storms, 52 in hurricanes, and 68 in unknown and variable weather. Of these 619 took place amongst ships in the home and coasting trade, commanded by men not required by law to have certificates of competency; 266 wrecks only occurred amongst vessels commanded by masters holding certificates of service. In all, there were 842 wrecks amongst our rotten collier class of vessels. Again, with regard to collisions, it appears that, during the last six years, 750 have taken place in clear and fine weather, 378 from bad look-out, 264 from neglect of rule of road at sea, and 61 from actual want of seamanship. So, then, unseaworthy ships, incompetent masters, and another cause or two—which we may not hint at, but with which "Lloyds" is not altogether unacquainted—have led to the destruction of many lives and much property, and swelled the list of casualties on our coasts for the year 1861. With causes so well defined, is not the remedy obvious?

It is quite natural that the great cotton question should continue to occupy a considerable amount of public attention. During the week the annual meeting of the Cotton Supply Association has been held at Manchester, and we are sorry to see that the report and the speakers took a rather desponding view of the matter. We have been induced to look at India as the principal field from which we might obtain cotton supplies. But what good are a productive soil and industrious lands if the means of transport be wanting. Mr. Haywood, who was sent to India by this association, says that no doubt India is capable of supplying from 4,000,000 to 5,000,000 bales of cotton annually; and that, had land and water communications been more extensively opened throughout the country, our present imports from thence would by this time have been doubled; that the rapid completion of railway will prove of enormous advantage, by hastening the establishment of European agencies in the interior; that branch feeders, whether railways or roads, will be required to connect the main lines with the remoter districts; and that more bridges are required, the construction of which would save thousands of miles of circuitous traffic. In fact, India wants the civil engineer and capitalist more than the cotton cultivator. The capacity is there to supply our wants, but the means of bringing the produced article must also be supplied. In this important crisis of our national history we are sorry to find that the government has not done more to promote productive works in India. Much blame is deservedly fixed on Sir Charles Wood, for his wooden-headed resistance to all improvement. In fact, the Manchester meeting called for his dismissal in most unmistakable language. That he is an incompetent minister there can be no doubt, and that he occupies his present position, not from any merits of his own, but by virtue of family influence, is equally well known.

It is not at all an unlikely thing that Turkey will by-and-bye be enabled to send us at least 100,000 bales of cotton annually. But Turkey, like India, wants English engineering skill, capital, and experience. The Turkish government is even showing more interest in the matter than the English government. In the International Exhibition there are contributions from thirty-five sources of cotton supply, yet the country had essentially depended on one of them. Should peace be established in America to-morrow, the Southern states would not be able for years to come to send us the accustomed supply. It therefore becomes a question of national necessity to get large quantities of the article supplied from other quarters.

In our last number we drew attention to the various substitutes proposed for cotton, during the past few weeks. Since then, however, another important step has been taken, which raises our anticipations to a higher pitch, and causes us to hope that the substitution of sea-weed may not turn out a disappointment. If, indeed, this should occur, there will be nothing to regret in the actions of the discoverer, who has manifested throughout singular disinterestedness.

The discoverer of the new fibre, Mr. Henry Harben, of Oxford-villa, Haverstock-hill, while spending a holiday at Harwich, tried various experiments upon sea-weed, and then upon *Eostera Marina*, which is known as common grass-wrack, growing in abundance on the sea shore. Though not a sea weed, it grows among them; the leaves, resembling a long narrow tape, often reach from three to four feet. It is found from the North Sea to the Mediterranean, in the Indian Ocean, and on the Arabian coast. It is not unknown to the country, having been used for a long time for stuffing cottagers' cushions and beds, and has also been introduced into the paper-makers' vat. Mr. Harben, at the committee meeting at the Manchester Chamber of Commerce, exhibited several specimens of the fibre in its natural state, and as used as paper, and as dyed, and dried. So sanguine was he of the results of any experiments that might be made upon this elastic, and it is said silky, texture, that he advised the unemployed operatives at once to collect it from all the sandy coasts of the country.

Whatever may be the feeling relative to this

discovery, and the admiration in which the discoverer is now deservedly held for his disinterestedness, it is still a question to be solved whether, after all, this is a material that can be converted into a substitute for cotton. There are many things to be said in its favour; and yet there are certain considerations which await solution, upon which the worth of the discovery depends. It must be ascertained whether it grows in such quantities as may be required, and then whether the fibre is capable of being spun on the machinery used for cotton; and, lastly, the essential consideration must be determined whether it will be as cheap as cotton. Specimens have been exhibited during the week, and favourable opinions have almost universally been expressed, so that it is not really a question whether it is likely to be in the abstract successful. That it can be turned into a substance which may be used as cotton, has, we think, been almost universally acknowledged; but the questions we have submitted for solution are important ones, and bear materially upon the acceptance of this new material.

It may turn out, however, that Mr. Harben was not the first to discover the capabilities of sea-weed as a substitute for cotton. A Mr. C. M. Archer in a letter states:—" Permit me to state that so long since as November, 1855—a period when there was a panic concerning an apprehended scarcity of fibrous material for paper—I then, residing at Haver stock-hill, after the usual labour, experiment, and expense, received professional protection and specification, No. 2,696, November, 29, 1855, from the Commissioners of Patents, for the 'production of fibre and paper pulp from sea-weed, and for the production of textile fabrics from the same.' I could descant on the question if required, but will be content if you will allow this fact, in fairness, to appear in the same columns that gave Mr. Harben's 'discovery' to the world; consoling myself with the old saying 'Sic vos non vobis."

THE IRON MANUFACTURE OF GREAT BRITAIN.

It has seldom fallen to our lot to introduce to the notice of the scientific public a more valuable work than that of which the title will be found at the foot of this page of the Mechanics' Magazine.* It is evidently the result of long, careful, and practical observation; and it forms at once a glorious monument to the memory of its author, and an excellent guide to those who are directly or indirectly interested in the great subject of which it treats. In the preface to the first edition of "The Iron Manufacture of Great Britain," it was truly said that, "among the manufactures "of this country, that of iron has risen to a "magnitude which entitles it to rank as the "most important, both as regards the value "of the products, and the direct bearing they "have on the progress of civilizstion and "commerce." If this were true at the time it was written, most assuredly its truth comes home to us now with intensified force, for the development of the iron manufacture of Great Britain, during the past few years, has been marvellous; and at this moment that development, so far from exhibiting signs of abatement, is proceeding with increased spirit. It is needless to trace the momentous consequences which result to us, as a nation, from this ever-growing and persistently-energetic demonstration of material wealth and industrial talent. Those consequences are well known at home and widely felt abroad. The railroad, steamboat, the armed leviathans of the ocean, everything that mind can conceive or devise, and skill realize in the form of iron manufactures, are helping to maintain this country as the foremost among the nations of the earth; and, humanly speaking, there is small chance of our national declension, so long as superiority in the manipulation of iron is preserved to us.

The book which Mr. Truran has left us as a rich legacy, and which his moral and literary executors, Messrs. Phillips and Dorman, have taken great pains to place in the best and most available form before the scientific world, fills a void which, despite the efforts of many other able writers, existed in relation to the iron manufactures of Great Britain. It at once illustrates the progress which has heretofore been made in the wide and well cultivated fields of industry of which it takes cognizance, and indicates the directions in which present and future workers in that field must persevere if they would achieve yet further success.

The preliminary chapter of the work deals with various ores which are obtained in the iron districts; and with great minuteness describes their peculiarities, and individual characteristics. It is not, perhaps, needful for us to follow the author, and his *collaborators*, through this interesting and instructive department of their subject, although it must be admitted that it is fraught with importance, as metallurgists have not paid so much attention to it as they ought. Suffice it to say, that for the sake of facilitating explanation, the ores from which crude iron is omitted in Great Britain are divided into four great classes:—1st, the argellaceous ores of the wet formations, having clay, but sometimes silica, as their chief impurity; 2nd, the carbonaceous ores of the same formation distinguished by their large per-centage of carbon; 3rd, the calcareous ores, principally obtained from the limestone of the coal measures, and having lime as their chief earthy admixture; and 4th, the siliceous ores, having silica as their predominating earth. The last class is sub-divided into the red and brown hexmatites, the ores of the oolite formation, the white ex-carbonates, and the magnitu oxides. Careful descriptions follow of the circumstances under which the several ores referred to are usually found, and also tables, demonstrating the proportions in which the impurities named are generally enveloped on analysing the ores themselves. We are not aware of the existence of any more complete or practical exemplification of the nature of the iron ores of this country, than is afforded by the work under review; and we imagine, therefore, that to iron smelters this chapter will be of especial value. As a natural sequence to their account of this branch of iron manufacture, the author leads us to a consideration of the fuel and flux employed in the elimination of the crude iron from its natural companionship and native adulterations. "The fossil fuel with which this "country abounds is now almost exclusively "used in all the various operations connected "with the manufacture of iron. Charcoal is "now, from its high price and scarcity, only "used for the conversion of malleable iron into "plates and bars for tinning, and other pur-"poses where a very superior quality of iron "is desired. The South Wales basin is at "present that from which the largest quantity "of coal is being extracted and used in the "iron manufacture. Its great area, and the "superiority of its products over those ob-"tained from any other formation in this "country, will, doubtless, enable it to main-"tain this position for many centuries to come. "It possesses, indeed, coal of nearly every "quality with which we are acquained. On "the eastern side the seams are generally of a "bituminous character. Further west, fol-"lowing the northern outcrop, they are found "to be semi-bituminous, as at the Rhymney, "Dowlais, and Penydarran works; and in the "Neath Valley the different seams are changed "into anthracite; and the characteristic of the "Welsh coals, and which distinguish them "from all others, is the large amount of carbon "they contain. In smelting, as well as in "other operations of the manufacture of iron, "the useful effect of coals is in direct propor-"tion to their richness in carbon. The Welsh "coals used in the blast furnace ordinarily "yield from 80 to 92 per cent. of carbon."

Following this testimony to the efficiency of the coals of the Welsh seams, for the purposes of smelting, and we are given lucid tabular statements of the coals of the Scotch and other fields and their varying components. To the iron founder it is needless to expatiate upon the importance of the information thus conveyed, because he will be fully aware of the good or bad effects which invariably follow the use of good or bad coal. It was, he well knows, a point upon which the quality of his castings much depends; and, next to obtaining irons suited to the particular work he has to produce, is the employment of the right fuel for melting them. It has been too much the practice of those who have the working of iron foundries to depend rather upon their own limited knowledge, or rather their own practical observation and experience, than to look round them for those general, but yet inevitable, laws which govern the operations of the furnace, and determine the quality of the castings which emanate from them. It is in the furnaces that this future casting has its character determined; and how consequential therefore is it, that the materials employed in the furnace should be so well understood, as to ensure good results. This work throws a strong and clear light upon the nature of the raw substances, from which good iron may be obtained, and upon the kinds of fuel, by aid of which, those substances may be made to yield the purest metal. It is of equal moment that in the foundry the rules which have been observed in the process of smelting should be followed because the best materials may there be spoilt by improper or careless treatment.

In the second section of "Iron Manufactures," the question of the calcination of ores is treated of, and the various kinds of kilns employed for the purpose are minutely described, and elaborately illustrated by plates. The importance of this operation is too well known to need any advocacy on our part. Calcination when properly performed, effectually deprives the ironstone of water, sulphur, carbonic acid, and other bodies capable of being volatilized at the temperature maintained in the kiln. The loss of weight resulting from calcination varies in amount with the character of the ironstone, and this loss is carefully tabulated in the book before us. "The rich hexmatites of Lancashire and Cumberland lose about six per cent. in weight by passing through the calcining kiln. The hydrated hexmatites of North Wales, Cornwall, Devonshire, and other places, on the contrary, are reduced in weight by the process, to the extent of 12 or 14 per cent., when clean. But if these ores be mixed with much extraneous matter, which

* The Iron Manufacture of Great Britain, theoretically and practically considered. Including descriptive details of the ores, fuels, and fluxes employed, the preliminary operation of calcination, the blast, refining, and puddling furnaces, engines and machinery, and the various processes in union, &c., &c. By W. Truran, C.E. Second edition, revised from the M.S. of the late Mr. Truran by J. Arthur Phillips, and Wm. H. Dorman, C.E. London: E. and F. N. Spon, 16, Bucklersbury. 1862.

unfortunately for iron-masters, is now too often the case, they are likely to lose 24 or 26 per cent."

We arrive now at another point, which has for some years past occupied largely the attention of practical men, but about which there is much yet to be learnt by many of them, and that is the proper construction of blast furnaces. Comprehensive particulars of the mode of forming those hitherto employed in the various districts in which they are used, and especially of those situated in Wales, are given, and practical suggestions towards improvement also abound. The cupola furnace is dwelt upon at some length, and the advantages resulting from their use demonstrated. Important alterations have been made of late in the apparatus employed for lifting materials to the level of the charging plates, where natural facilities for effecting the operation do not occur, and their alterations are carefully noted.

Without referring to the rather ancient means of accomplishing this object by the aid of water, it may be well to speak at some length of the pneumatic machinery, in several instances successfully used. The pneumatic lift consists of a well, sunk in the rear of the furnace, usually about 7 feet in diameter, and from 8 to 10 feet deeper than the height of lift. This is made water-tight by a brick, cement, or metal casing. A wrought-iron cylindrical tube, open at the lower end, and closed at the top, works up and down in this well. On the top of the tube a suitable platform is fixed, for carrying the loaded barrows. Four chains are attached to the platform, and passed over pulleys on the top of the frame-work, weights nearly sufficient to balance the tube and platform being hung to their extremities. Perpendicular timbers act as guides to the platform, which is furnished with four angular pulleys as guide rollers. A pipe, fitted with a stop valve, is brought from the blast main. This pipe is carried down one side of the wall to the bottom, then turned up in the centre, and brought to within four or five feet of the surface. The well is filled with water to within five or six feet of the top. The wrought-iron tube, open at the lower end, stands in it, and surrounds the central upright pipe. The action of the apparatus is as follows:—Loaded barrows having been wheeled on to the platform, the stop valve in the blast pipe is opened. The blast is thus made to press against the top of the tube with a force proportionate to its density, and to the area of the end of the tube. This force raises the platform, and thus carries the loaded barrows to a level with the charging plate. On arriving there, the blast valve is partially closed, and the tube is, *pro tem.*, sustained by the elasticity of the blast within.

The loaded barrows are now wheeled off, and after their contents are discharged into the furnace, they are replaced on the platform for descent. In order to accomplish this, the inlet valve below is closed by means of a vertical rod, and an escape valve at the top of the tube is opened, to allow of the gradual egress of the compressed air within. The pressure being removed from beneath the platform, naturally descends by force of its own gravity, and this with a spirit governed by the area of the escape valve.

By this admirable and economical arrangement it will be seen that the chances of accident are almost entirely obviated, whilst the workmen, by the use of the simplest possible apparatus, and without manual labour, are enabled to perform the duty of supplying the furnaces with the necessary charges. In ascending, the speed is easily regulated, the quantity of blast admitted being capable of adjustment to the exact requirements of the load to be raised. By partially closing the inlet valve before arriving at the top, the whole weight in motion, and which not unfrequently amounts to thirty tons, may be brought to a state of rest without concussion. It, in fact, floats, as it were, on a pillow of air to the exact height required.

At the Corbyn's Hall new furnaces we are told that "one pneumatic lift, with a tube of "five feet six inches in diameter, lifts the whole "of the materials for four blast furnaces. The "inlet pipe in this instance has a seven-inch "bore, the pressure of the blast being equal to "2⅓ lbs. on the square inch. The area of the "cylindrical tube in square inches, multiplied "by the pressure, that is 342 in. by 2⅓ lbs., "gives a lifting power of 7,981 lbs. The "load of materials lifted each time equals "5,040 lbs., and thus there remains a surplus "power of 2,941 lbs. to cover the unbalanced "weight of tube and all contingencies." The actual working cost of lifting the materials is as great, perhaps, as it would be with the inclined plane or water-balance lifts, but the cost of repairs is undoubtedly less. As, in our opinion, the principal of raising weights by pneumatic means, as well as the application of pneumatic force to other purposes, is likely to be carried much further than it has hitherto been, we have no hesitation in transferring to our pages the results of calculations made in the book, under the notices as to the expense of working the Corbyn's Hall lifting apparatus. The *cost* of accomplishing mechanical operations it need scarcely be said is one of the main considerations which govern their uses. "With an apparatus of the foregoing dimen-"sions, lifting vertically fity feet, the consump-"tion of blast is found to be about 1,200 "cubic feet for every one and a-half tons "raised. Allowing that it requires 8 tons "of material to each ton of pig-iron made, "an expenditure of 6,400 cubic feet, at a "pressure two and one-third pounds per "square inch, will manifestly be required to "raise the weight of materials named. The "cost of compressing air will be affected by "local circumstances (as for example the price "of coals); but at several of the Welsh works "it has been proved that the expenses of "compressing 100,000 cubic feet of air to the "density of two and one-third pounds on the "square inch, does not exceed 3d. This is "equal to three-sixteenths of a penny per ton; "and if to that be added another three-six-"teenths of a-penny, for the cost of erecting and "manufacturing the apparatus, we have a "charge of three-eighths of a penny per ton on "the pig iron made, as the cost of lifting the "materials 50 ft. high." To this statement it is not necessary to append remarks of our own, because it affords ample evidence of the expediency of adopting—wherever, as has been said, material means do not exist—pneumatic appliances for feeding the blast furnace.

The hot blast, now so extensively adopted in the manufacture of iron, is dwelt upon with satisfactory minuteness in the work before us, and to the general operations of the furnace many pages are devoted. This is followed by tables of analysis of the irons of the various seams of this country, as well as of other parts of the world. To these tables, which will add most materially to the knowledge already obtained by most of those persons to whom such knowledge is of value, it is not possible for us further to allude. This compilation demonstrates yet further the extraordinary amount of labour and research which has been exercised by those who have produced this remarkable contribution to the scientific literature of the country. The sixth section of the "Iron Manufacture of Great Britain" is devoted to the discussion of the vital questions of the "produce and quality of metal." As, however, our review has already extended to the full limit which can this week be afforded it, those questions, and the manner in which they are answered, must, perforce, stand over till the appearance of our next issue.

(To be continued.)

THE MANUFACTURE OF GUNPOWDER.*

So long as war continues to be the *ultima ratio* of nations, so long will it be important to pursue those investigations which have for their object the perfection of war *materiel*, whether for purposes of attack or defence. The book before us is an opportune contribution to the art and science of warfare. At a time when the merits of Whitworth and Armstrong guns, armour-clad vessels, &c., are exciting so much attention, and passing through the ordeal of severe scrutiny and unqualified discussion, such an elaborate work as Col. Anderson's becomes invested with more than ordinary interest. The body of the work was written by the late Colonel Anderson, and was intended by him to exhibit the result of his "earnest "study to acquire an insight into the theory "of gunpowder, and by much labour in mak-"ing numerous experiments to test and fortify "the art of manipulation as practised at the "Ishapore Mills." The MSS. were placed in the hands of Lieutenant-Colonel Parlby, who is an experienced artillery officer, and was for some years "agent for the manufactory of gun-"powder and war rockets at Allahabad, in Ben-"gal," and who has, by various notes and additions, sought to exhibit the progress of improvements to the present time. We join the gallant editor in his deprecation of the conduct of the authorities in refusing access to the reports of the experiments made at Woolwich and Shoeburyness at the national expense, and cordially agree with his observation that it would be "very useful if the causes of *the failure* in "every projected improvement were publicly "known and explained." *Failures* are great teachers; and the quotation by the editor of Watts' reply to one who was congratulating him on his extraordinary powers of invention and mechanical skill is very apposite,—"You "are regarding what I have succeeded in, but "you are little aware in how many instances "I have failed in perfecting what I aspired "to do."

In the first twenty pages of this volume we have a very succinct account of the "his-"tory of gunpowder." This account strengthens the generally received opinion that the manufacture of gunpowder originated in China and India, and that the absence of any written records indicating the precise date simply proves the antiquity of its discovery. This is the case with many substances. "Let us," says the editor, "con-"sider the subject of iron alone—the most "useful and widely-distributed metal on the "earth's surface. We know, from the earliest "and most sacred of writings, that the use of "iron may be traced back to the greatest an-"tiquity of the race of man, but all is perfectly "obscure as to the date of its first discovery, "except that it was most extensively used and

* Sketch of the Mode of Manufacturing Gunpowder at the Ishapore Mills, in Bengal, with a Record of the Experiments carried on to ascertain the value of charge, windage, vent and weight, &c., in mortars and muskets; also Reports on the various Proofs of Powder, by Colonel William Anderson, C.B., late Agent at Ishapore, with Notes and Additions by Lieutenant-Colonel Parlby, Retired Bengal Artillery. Weale. London. 1862.

"wonderfully worked up." That gunpowder and fire-arms were in use in India in the earliest ages the oft-quoted passage from Mr. Holhed's translation of the code of Gentoo laws, supposed to have been compiled at the time of Moses, B.C. 1500, sufficiently proves.—"The magistrate shall not make war with any "deceitful machine, or with poisoned weapons, "*or with cannon and guns, or any kind of fire-"arms.*" "The invaders of Northern India," says the editor, "may have brought these. "The repressive influence of the laws of the "Gentoo code, and their effect upon a super-"stitious, submissive, indolent, and uninven-"tive people, may have caused their use to lie "dormant for many centuries after their in-"vaders retired."

Speaking of the "early establishment of the "manufacture of gunpowder in Bengal," our author observes, that "the chief cause of the "inferiority in gunpowder is that, if the in-"gredients are not carefully refined, and care-"fully manipulated, the powder quickly de-"teriorates from its original strength of "propellent force when fresh from the mills. "In the early days of European occupation, "war and battle were too frequent to admit "of the powder being long stored in "the magazines. With native armies the "powder-makers followed the camp; the "women of families often manufactured the "article for the matchlocks of their husbands. "Such, too, at the present day, is the custom "in the wilds of Afghanistan, where the hand "flour-mills of the huts are occasionally seen "grinding the sulphur and saltpetre, to fabri-"cate a coarse powder for the use of the men "on their sporting occasions and plundering "forays."

Up to the year 1784, the Government was supplied, at a high price, from the native manufactories near Calcutta, where several existed. These were subsequently removed, as endangering the city, to Akra, where they continued some years. But this place, being considered too much exposed to the operations of an invading force, the celebrated miser, John Farquhar, who, it is said, speculated in every article of Indian produce, "from silk for the markets of Europe to *pork* for the bazaars of Calcutta," induced the Government in 1794, to exchange with Rajah Nubookessen some lands at Satanooly, near Calcutta, for the factory at Banku Bagnar, now called Ishapore, which he had re-taken from the Dutch. Here the works, which have grown to an enormous extent, still continue, and here some bronze metal machinery, cast under the superintendence of a foreign gentleman from the Mauritius, whom Colonel Galloway induced to settle in Calcutta in 1820, are still in operation. As our East Indian dominion became extended, fresh gunpowder works were established at Alahabad by Captain Taylor, but these, as well as those at Ishapore, were, from economical motives, suspended for three years, during the governor-generalship of Lord William Bentinck, and the former have never since been re-opened; a circumstance which our author thinks has turned out very fortunate, "as in the late mutiny and occupa-"tion of Alahabad by the mutineers, the most "serious results would have followed."

There is an interesting account of "The History of the first Establishment of Gunpowder in England," obtained by a careful study of the papers of the "Public Record Office," kindly permitted by Mr. Hart. The gallant editor thus closes this account:—"Al-"though the manufacture of gunpowder com-"menced in England in the time of Edward "III. (1345), it was not until the reign of "Queen Elizabeth, when the improved art was "imported from Flanders by the Evelyns, that "it was fairly established; also, that until the "reign of Charles II., the quantity required for "the king's service, and of saltpetre also, was "not sufficient, and that large quantities were "imported from various foreign countries."

By various Letters Patent, commencing in the reign of Elizabeth, several parties received permission "to dig, open, and work for saltpetre" in different portions of the realms of England and Ireland, and our author says, "It may be a wrong supposition, but with all "this digging for saltpetre, to the great distress "and worrying of the inhabitants of houses "in the town and country, gardens, orchards, "&c., which led to much discontent, probably "our great Shakespeare took the expression "(Act I., Henry IV.):—

"'And that it was great pity, so it was,
That villanous saltpetre should be digg'd
Out of the bowels of the harmless earth,'

"since the general practice in countries where "it abounds is to obtain it by lixiviation of the "upper soils."

On "The General Principles of Gunpowder," our author observes, "the first object in the "manufacture of gunpowder is to obtain, in "small space and weight, a material which "produces, when excited by chemical action, "a high propellent force, possessing an expan-"sive power which shall be gradual, progres-"sive, and under good control. Such is gun-"powder. Thus, the weight of 2 oz. will, in "its expansion when fired, propel 1,088 oz., "the weight of an iron ball placed before it "in a mortar, the distance of 100 yards" No substance yet discovered possesses these qualities so as to become a substitute for gunpowder. "It is a singular circumstance that, notwith-"standing the advance of science, and the "wonderful chemical progress of the moderns, "there has been no substance yet produced "that possesses all its advantages, and that the "three materials used in its composition from "the earliest times, viz., saltpetre, charcoal, "and sulphur, have not been superseded by "others." The gallant editor, in the appendix to the work, enters into the consideration of gun-cotton, compounds of nitrate of soda, nitrate of ammonia, and chlorate of potash, which have at different times been brought forward to supersede gunpowder, and fully confirms the opinion of the learned author.

"The Chemical Properties of Gunpowder" are fully discussed and will repay for very careful perusal.—"There can be little doubt that in "the first formation of gunpowder, when the "science of chemistry was comparatively un-"known, accidental circumstances led to these "properties (change from a solid to an expan-"sive gaseous or aeriform state by the appli-"cation of heat) being discovered in the "mixture of saltpetre, charcoal and sulphur, "probably in the first instance only saltpetre "and charcoal were used." Modern chemistry has, however, developed the properties in these substances which render them so essential in the formation of gunpowder. Saltpetre, or nitrate of potash, contains nitric acid 54, and potassium 46 charcoal and sulphur are regarded as simple substances, although it seldom happens they are pronounced pure. Gunpowder, therefore, consists of one compound and two simple substances. "The compound "(saltpetre) consists of nitric acid combined "with a base of potash. The nitric acid "consists of oxygen and nitrogen, six parts of "oxygen to one of nitrogen; when saltpetre "is exposed to a red heat, or above 800 deg., "it decomposes gradually, if there be no com-"bustible present, and a portion of the oxygen, "and all the nitrogen, will pass away into the "atmosphere; the other portion of the oxygen "will unite with the potash and form oxide of "of potassium; but when we bring a com-"bustible, as charcoal, into contact with the "saltpetre at this heat, a violent and sudden "decomposition takes place, and consequent "explosion, from its striking the air so sud-"denly. The oxygen combines with the "carbon, forming carbonic acid gas, and the "nitrogen is set free. It is found from experi-"ment that the volume of gaseous or aeriform "fluid thus formed, occupies a space, as a per-"manently elastic fluid, about 240 to 290 "times that of the bulk of the gunpowder "used, when cooled down to the state of the "atmosphere; but at the time of explosion the "heat generated is so great; that the expansion "of this volume of gas is increased from four "to eight times its bulk, varying according to "quantity and quality of the gunpowder and "the circumstances of the explosion. Such "is the cause of the amazing power of the "explosion." After this *rationale* we are informed of the parts the sulphur performs, viz., more complete combustion. the closing of the absorbent pores of the charcoal, and increased tenacity in the granulations, thus rendering it an essential element in the manufacture of good gunpowder. The proportions of these three substances next pass under review, and an instructive table is furnished, based on the theory of chemical equivalents. "And," says our author, "it is "a curious circumstance, that the resulting "properties of chemistry are nearly those "universally made use of by manufacturers "in early times." This the editor illustrates by a carefully-compiled and clearly-expressed table. It has been observed that one measure of gunpowder will yield from 240 to 290 equal measures of permanent elastic gas. If the temperature during combustion be as high as "2,196 deg. Fahr., this will create an expan-"sion, or a propulsive force of about 1,592 "atmospheres; taking the atmosphere at only "14½ lbs., there results the astonishing pres-"sure of 1,592 by 14½, equal to 22,074 lbs. "on the square inch of surface at the moment "of combustion."

Saltpetre abounds in India, but particularly in the presidency of Bengal. This is obtained by the natives, by a process fully described by the author. It is called culmer saltpetre, and is sold to the Gunpowder Agency, at Calcutta; it contains, however, a large per-centage of extraneous salts, which have to be removed before it is fit for the manufacture of gunpowder. This is accomplished by boiling and crystallization. Formerly, the boiling was repeated twice; but by the improved process now in use, one operation suffices. "The "usual impurities of unrefined saltpetre—as "nitrates and muriates of lime, with other salts "having bases of magnesia and soda—dissolve, "and remain in solution, equally, in hot or cold "water, and saltpetre has the property of "excess of solution, as the temperature is in-"creased. Advantage has been for some years "taken of this property, both in France and "at Madras, as well as the saving of labour "occurring in preventing large crystals being "formed by the slow process of cooling, by "keeping the solution in agitation during the "boiling, so as to obtain pure saltpetre, in the "state of fine meal, at one operation. This "new system of refining, has now been im-"proved upon, and adopted at the Royal Mills, "Waltham Abbey, and some other private "manufactories.

"A quantity of unrefined saltpetre, accord-"ing to the size of the manufactory, say 40 "cwt., is put into a copper boiler, holding 500 "gallons, with 270 lbs. of water, and brought

"to a boiling point; the impurities are carefully skimmed off as they rise, and a small additional quantity of cold water is occasionally thrown in, to assist in the precipitation of such salts are are not equally soluble with the nitre, as the temperature rises. After boiling about three and a half hours, the fire is damped, and those salts that have crystallized fall to the bottom. In about two hours a copper pump is used, to pump off the solution into a trough, properly provided with criks, to each of which a canvas bag of the jelly-bag shape, is attached, and the solution runs off through the canvas, into large troughs, 10 ft. by 6 ft. wide, 9 in. deep, lined with sheet copper, and is kept in a state of agitation with wooden rakes until nearly cold. Thus a large quantity of very minute crystals are formed, which are drawn up by a wooden hoe, and thrown by a shovel on a framework wire sieve resting on the opposite sides of the trough; here they are allowed time to drain, and have the appearance of fine white snow; when drained sufficiently the produce is raked over into a washing cistern, conveniently placed, which is 6 ft. long by 4 ft. wide, and 3 ft. 6 in. deep, fitted with a false bottom of wood, which is removable at pleasure." Here the saltpetre uudergoes two washings, and is, after a few hours, found, upon raising the bottom of the cistern, to be perfectly pure. The moisture it contains is thus evaporated in copper trays. The editor furnishes a list of the apparatus for thus refining in one day what formerly occupied six, and for producing 23 hundredweight of refined saltpetre *per diem*. This apparatus is, as he says, trifling in quantity.

We are next introduced to the process of preparing charcoal, which is illustrated by a finely-executed plate, representing a charcoal furnace. To test the purity of charcoal—"One hundred grains must be well digested in hot distilled water, when the solution of nitrate of silver and nitrate of barytes will indicate the presence of muriate and sulphate of soda if any exist. Acids will be rendered apparent by litmus paper. If the solutions contain any alkali, the original blue colour will be wholly or partially restored to the reddened paper."

On the refining of sulphur, the remaining constituent of gunpowder, after a full description of the mode practised in India, we are initiated into the new mode, as practised at the Royal Mills, Waltham Abbey. This is by distillation, and is considered the best for rendering the sulphur pure, and especially freeing it from all acids, which is of great importance. The purity of the sulphur is thus ascertained: a small portion is burnt, by exposing it to heat over a lamp, on a piece of porcelain or sheet platina, when no residue should be left, as the sulphur will pass off, in a state of vapour, into the atmosphere; if boiled in distilled water, the water should produce no discolouration in litmus paper.

The three ingredients, now being prepared and and sifted, "are conveyed to the weighing-house in proper quantities, where the man prepares them in the relative proportions of seventy-five-hundredths of saltpetre, fifteen-hundredths of charcoal, and ten-hundredths of sulphur for a mill charge of 80 lbs. He uses leaden weights of 30, 12, and 8 lbs., dividing the saltpetre into two parts, so as to confine the charcoal and sulphur between them. The whole is slightly intermixed, by hand, in a woooden box, carefully surrounded by a cloth covering, to prevent the escape of any of the light particles." Our author observes, "As the entire loss, by wastage, in the manufacture of the prepared ingredients is about 5 per cent. of the composition, perhaps it would be better if that per-centage were added at first to the mill charge, so as to conclude the process with the full 80 lbs. of powder."

The important processes of dry-mixing, incorporating the ingredients, bruising, pressing, granulating, sifting, glazing, drying, and packing, are next described. The ingenious and often delicate machinery employed is illustrated by accurately-finished engravings, most of which are drawn to a scale, and the various modes, quantities, and results brought vividly before the eye by means of carefully-compiled and clearly-executed tables.

(To be concluded in our next.)

LONDON BRIDGES.

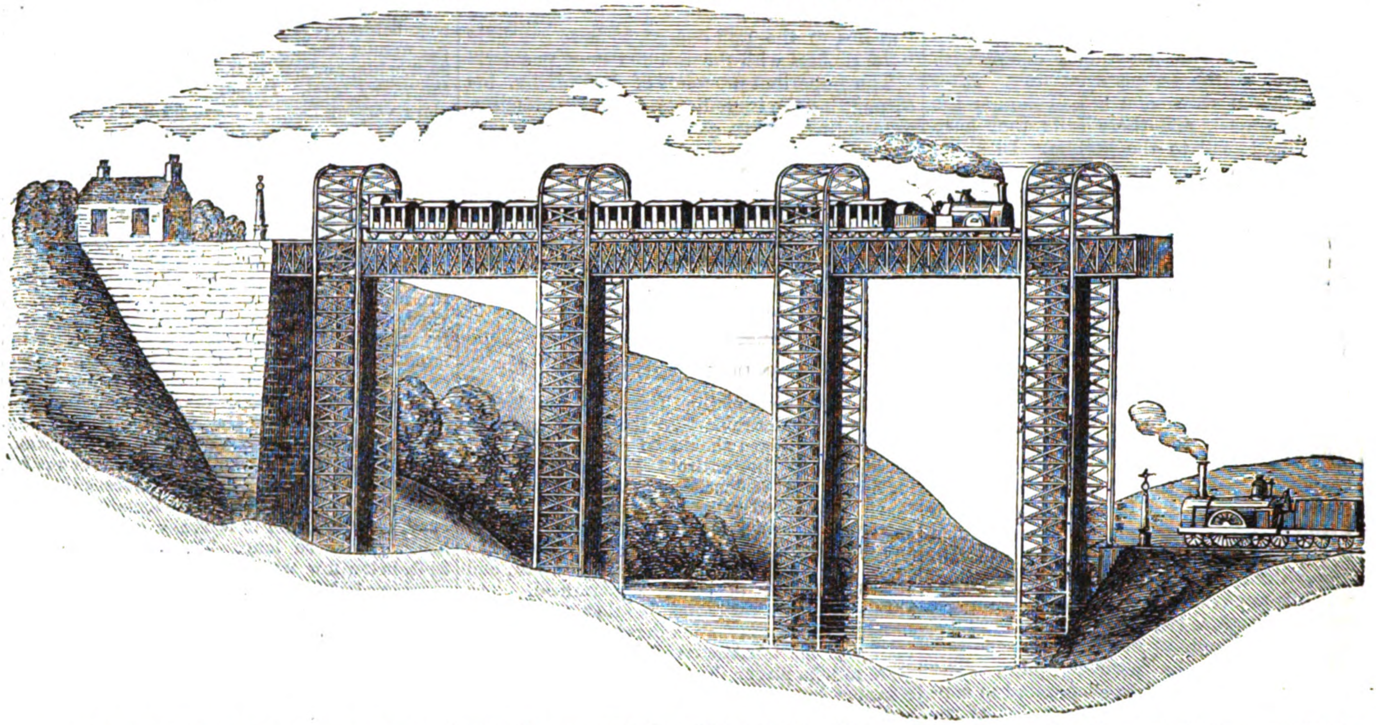
The construction of the Thames embankment will render it desirable that the whole question of London bridges should be reviewed and investigated in its entirety at an early date; for unless that is done, and provisions made to meet the altered *regime* of the Thames, due to increased scour and alteration in the direction of the currents, Londoners may awake some fine morning to find three of their bridges down, and the foundations of others undermined. The reader can more easily imagine than any pen can describe the consternation that would seize on all classes of the inhabitants if such a catastrophe were to take place. The bridges, whose foundations are insecure, and believed to be unable to resist increased scour, are Waterloo, Blackfriars, and Southwark. Engineers declare them liable to go at any time with a deepening channel, such as we shall have after the embankment is completed. The proprietors of Waterloo are nervously alive to the dangers which threaten the Surrey arches of their structure. Blackfriars is propped up, and as to Southwark, is not Robert Stephenson's opinion on record as to the ignorant and unscientific way in which it was designed and erected—the ignorance which made no allowance for the expansion and contraction of iron, according to the variations of temperature, and which have resulted in the splitting and fracture of nearly every part of the fabric? Even London bridge itself is not considered positively secure, and it will be remembered that the late Mr. Rendel, together with Mr. Simpson, declared that new Westminster was not founded deep enough to place the supports of the piers below the level to which the action of the scour might penetrate hereafter, and during the time the edifice might be expected to stand. Although the anticipated scouring effect of a contracted channel may have been exaggerated, and we believe Mr. Page, designs will attain the average duration of existence of like works, the dangers to the three bridges named above remain the same. We do not mean to assert that they will tumble down into the bedof the river before a certain date; but if they be allowed to remain as they are such an occurrence comes within the range of probabilities. Or, if they do not collapse into heaps of rubbish, they are still more likely to crack, from subsidence of the foundations, and become impassable, while they will, at the same time, seriously impede the navigation of the Thames.

Let us see how they have been built.

It certainly does not argue much for the activity of the trade of London, nor for the prudent attention of the inhabitants to its requirements, that, during the whole of the Middle Ages, and indeed until about a century ago, there should have been only one bridge over the river. Ancient Rome had eight, and Paris, under the reign of Henry IV., had six. Even as it was old Lond on bridge could have afforded but very slight accommodation to traffic, until the houses that were built on it, and encumbered the way, were pulled down in 1760. It was a curious quaint structure, such as our grandfathers may have beheld before the alterations were made by Dance and Taylor, and as the old curate of Colechurch designed it. Hawksmoor says the river here was 900 ft. across, and at the water-way below the starlings was no more than 190 ft. No wonder it acted as a dam. It was 296 ft. long, 20 ft. wide, and was 40 ft. high in the centre above the water level. It had 20 arches, carried on piers varying from 25 ft. to 34 ft in thickness; a chapel in the centre, and at each end a fortified gateway, which was generally well garnished with heads of so-called traitors. So difficult were the approaches, that when the houses at the Southwark end took fire, at the commencement of the thirteenth century, and those at the north end were fired, upwards of 3,000 people perished. The roadway passing between two rows of houses that shut the river out from view, was not only troublesome, but dangerous, says Stow; and to augment the dangers of this middle passage, a market was held at one time on the bridge. A curious in the old edifice was the enormous thickness of the superstructure. The roadway was 8½ ft. above the crowns of the arches and had apparently risen by the accumulations of five different strata, one of which was composed of burned wood, the *debris* of the houses that had been destroyed by fire. The foundations were very defective, and it is really surprising they held together so long. The masonry was but 2¼ ft. below low water mark, and rested on oak planking 16 in. wide by 9 in. thick, which in turn was supported by a mass of Kentish rubble, mixed with chalk and flints, thrown in and held together by starlings. Parts of the piers had been faced at some early period, but very ill and carelessly, and no part of the original work rested on piles.

Although in subsequent bridges bearing piles have been used, it is not improbable that their absence in the old bridge was the cause of its standing so long; for, after all, piles do disturb the ground and break it up, when compact as London clay is. In new London bridge the masonry of the piers rests upon 6 in. beech planking, laid on two rows of horizontal sleepers, about 12 in. square, that cover the tops of piles driven 20 ft. into the London clay. The foundations of Waterloo are also supported on beech and elm piles, of the same size and depth as those of London bridge, having sleepers at top, to hold them together, to which a timber flooring was spiked. The piers of Southwark bridge are seated on the clay, we believe, but are enclosed by timber sheet piling. Blackfriars was built on fir piles; and as for old Westminster Bridge, its novel system of founding was a failure from the first; but whether that was due to Labeye not using piling to the piers, or to his caissons, cannot be satisfactorily determined now. It is for this reason that it will be desirable to watch the behaviour of the piers employed in Lambeth and Charing Cross bridges; for if they are found to stand well, and to afford no indications of settlement, bridges may be built over the Thames at comparatively trifling cost, and without impediment to its navigation. London bridge, with the approaches, cost nearly two millions, while Mr. Barlow proposes to build one of his wire suspension bridges at Tower Stairs for something like £50,000. It wiil not be much longer than Hungerford Chain bridge, which cost £180,000. Certainly, if this gentleman be successful, and enabled to construct the two other bridges which he has suggested at Paul's Wharf and Essex-street, London's want of bridges will be pretty well remedied; but unfortunately they will levy tolls, and there will be only three toll free. Now it is really unworthy of a city like London, that tolls should be taken within its limits; for they are a serious tax upon traffic, and tend to divert it from its natural channels. The money which the corporation proposes to spend in erecting Mr. Cubitt's design at Blackfriors would suffice to erect five according to Mr. Barlow's system. Surely it would be better, until after Lambeth bridge has been open for some time for traffic, to ascertian the stability of the structure, and, if found satisfatory, to adopt the new system of construction, in order to give us half a-dozen new bridges in the place of one.—*Building News.*

AERO-HYDROSTATICAL HOISTING APPARATUS.



AERO-HYDROSTATICAL HOISTING APPARATUS.

In the western annexe of the International Exhibition is to be seen two models, illustrating an apparatus for hoisting and lowering heavy weights, such as railway trains, from one level to another. The apparatus is termed an Aero-hydrostatical Balance. The inventor, Mr. Sieler, states that the model has only lately been placed in the building, therefore the jurors could make no mention of it in their report. The principle of the apparatus, which will be partially understood by the engraving, is based upon the displacement of water and of enclosed columns of air, in communication with each other by a tube, and set in motion by a surplus weight, which consists, generally, of a volume of water. When ponderous bodies are to be alternately and intermittently raised and lowered to or from either small or great vertical heights, such as, for instance, a whole railway train, there needs but a surplus weight of from 3 to 10 per cent. (according to the desired speed) of the whole weight to be hoisted or lowered, to enable that same weight to ascend or descend, whatever may be the space of time between each train.

The surplus weight necessary to lower the balance may, in most cases, be procured from an approximate or distant rivulet or stream, made to accumulate its water in a reservoir; no matter whether it be at a much lower level than the ground on which the apparatus stands.

The models before mentioned represent a bridge, upon which stands a railway train, to be raised to a height of 115 feet in less than five minutes, and is made to work by means of a tube 100 feet in length, leading from an air holder.

In full size, it would consist of two cylindrical air chambers or holders, 11 yards in diameter, having together a surface of 180 square yards, upon which rests a bridge bearing a train which, with the weight of the immersed air holders, weigh 550 tons. A 3-feet-diameter tube, provided with a stop-cock or valve, puts them in communication with a *main acting chamber* or motor of an equal surface, 180 square yards, on the top of which is fixed a tank, made to contain sufficient water to equilibrate the 550 tons weight of the train. This acting chamber may be placed anywhere, at any distance where water can be had, and stands between two reservoirs, easily formed one above the other, from which water is procured for adding to the different loads of the train, a surplus weight which enables them to be hoisted or lowered.

The inventor gives the following example: Take from the lower reservoir sufficient water to equilibrate the weight of 550 tons, and force air into the three chambers until double the weight of water, 1,100 tons or 1,440 cubic yards, be displaced from their inside. From this moment, the resistance of the weight is overcome, that is to say, that the entire load floats on the air, which has thereby acquired a tension of 6½ feet of water, or a little above ⅕ of an atmosphere. Then shut the cock and continue to force air into the acting chamber only, until it raises out of the water and reaches a few inches under the level of the upper reservoir. It must be observed that the difference existing between the weight of the acting chamber when in and mostly out of water, is only 8 tons, therefore the amount of the surplus water thus displaced from within the acting chamber is very trifling compared with the immense weight to be lifted or lowered. When once the required bulk of air is forced in, it may be used over and over again, and any escape which may occasionally take place is easily replaced by an ordinary hand air pump. The railway train is made to ascend, by first letting water flow from the upper reservoir into the tank of the acting air chamber, until it is loaded with 5 per cent. above the weight to be hoisted, say 27 tons, and afterwards by opening the stop-cock. This causes the air to be driven into the two air holders in less than *five minutes*, during which the train ascends a height of 115 feet, whilst the acting chamber descends to the level of the lower reservoir. The cock must then be shut, and the train started off. Whilst waiting for the arrival of a train to be lowered, it is necessary to regulate the difference which may exist between the weights of the going and the returning train (always known before-hand.) by either adding water to the tank of the acting chamber, or removing some of it, in order that the train to be lowered may always weigh 5 per cent. above the volume of water to be lifted up by the acting chamber. Several successive trains may also be lifted up or lowered, with a loss of only 5 per cent. of water, by using a couple of acting air chambers, but if there be plenty of water one alone will do.

Mr. Seiler has also designed an aero-hydrostatical apparatus, for instantly raising out of water any floating dock containing ships of any size to be repaired; it will practically be more effective, simple, more handy, and cheaper than any other, because no foundation or masonry of any kind will be required to erect it. Being movable, and floating on air, it can be towed anywhere, in a dock, river, or the open sea.

Mr. Seiler has entered into a contract with some first-rate engine and iron bridge builders in France for the construction of his apparatus, and also wishes to find an opportunity to apply it in England, being fully satisfied that it may render valuable services.

ON THE CHEMICAL EXAMINATION OF IRON SAMPLES, AND OF THE MATERIALS EMPLOYED IN THEIR MANUFACTURE.*

By F. A. Abel, Esq.,

Chemist of the War Department.

(Continued from page 176.)

Phosphorus.—For the estimation of phosphorus, 50 grains of iron borings were acted upon with warm nitro-hydrochloric acid, in a flask with a long neck, and after complete solution of the metal, the contents of the flask were transferred to a porcelain basin and evaporated to dryness; the residue was moistened with concentrated hydrocloric acid, and again evaporated, so as thoroughly to expel nitric acid. The residue then obtained was dissolved in hydrochloric acid, the solution diluted, filtered, nearly neutralized with carbonate of ammonia, and the iron in solution reduced to protoxide by the addition of sulphite of ammonia to the gently heated liquid, and the subsequent careful addition of dilute sulphuric acid to expel excess of sulphurous acid. Acetate of ammonia, and a few drops of solution of sesquichloride of iron, were then added, and the liquid boiled, when the phosphoric acid was precipitated as basic phosphate of sesquioxide of iron, with some basic acetate. The liquid was rapidly filtered, with as little exposure to the air as possible, the precipitate was slightly washed and dissolved in hydrochloric acid, the solution neutralized with carbonate of ammonia, and a mixture of ammonia and sulphide of ammonia added; it was then gently heated, to ensure the conversion of the phosphate into sulphide of iron. The latter was afterwards removed by filtration, washed with dilute sulphide

* Report of Experiments on British Irons, Ores, &c., for the Manufacture of Cast Iron Ordnance.

of ammonium, and the phosphoric acid was precipitated from the solution in the usual manner as ammonia-phosphate of magnesia, and weighed as pyro-phosphate of magnesia, from the amount of which the phosphorus was calculated.

Combined Carbon.—After numerous comparative trials of the several methods in common use for determining the total amount of carbon in cast iron, that which was ultimately adopted (after necessary experiments had fully established its accuracy) consisted in dissolving the metal in an acid solution of chloride of copper, collecting and washing the insoluble residue which remained after the complete action of this solvent, and submitting it, when dry, to combustion with oxide of copper in a current of oxygen, the source of heat employed being the gas combustion furnace. The total amount of carbon in the iron was then calculated from the weight of carbonic acid absorbed by solution of potassa in the usual manner. The carbon, existing in a state of combination with the iron, was represented by the excess which this process afforded over that of the direct estimation of the carbon as graphite, in the manner already described.

Minute Proportions of Foreign Metals.—About 400 or 500 grains of the iron were employed in the examination for metals precipitated by sulphuretted hydrogen, *e. g.*, lead, copper, arsenic, &c. The iron was dissolved in hydrochloric acid, and the solution, diluted and partly neutralized with carbonate of soda, was submitted to the action of sulphuretted hydrogen. After saturation with the gas, the liquid was allowed to stand at rest for several hours, and the small quantity of sediment which had subsided was examined for metals by the ordinary analytical processes.

II.—ANALYSIS OF THE IRON ORES.

The analytical processes employed in the separation of the various constituents occurring in iron ores were, in a great measure, identical with those employed in the examination of metallic iron. Thus, the estimation of oxide of manganese was conducted in a precisely similar manner; and with the exception that no process of reduction was required in the case of clay ironstones and other ores containing the iron already in a state of protoxide, the phosphoric acid was determined by the same process as that employed for the estimation of phosphorus in pig iron. The amount of metallic iron, and its condition of oxidation in the ore, were determined by Marguerritte's volumetrical method, with standard solution of permanganate of potassa; while the proportions of lime and magnesia, carbonic acid, water, hygroscopic and combined, insoluble residue, and the nature of this latter, were determined by following the analytical processes invariably employed in mineral analyses of this description.

Sulphur was estimated by fusion of the ore (or, in the case of clay ironstone, of the clay only) with a mixture of pure carbonate of soda and nitre; the sulphuric acid being precipitated by chloride of barium, from the acidified solution of the fused mass, and the sulphate of baryta collected, burnt, and weighed as usual. The hydrochloric acid solution of the ironstone was examined for sulphuric acid, but it was seldom that more than a trace of sulphur was detected in that form.

III.—ANALYSIS OF THE SAMPLES OF FLUXES.

These materials, consisting of limestone, burnt shale, &c., were analysed by a method precisely similar to that employed in the examination of the ores. In the tabulated statement showing the composition of the limestones, the amount of lime is, in some few instances, represented by the difference, after the whole of the other constituents had been determined. In such cases the sum total of constituents is necessarily expressed by 100 exactly.

IV.—ANALYSIS OF THE SAMPLES OF FUEL.

Sulphur.—For the estimation of sulphur, 20 grains of the finely-powdered coal or coke were fused in a platinum basin, with 500 grains of a mixture of four parts of pure chloride of sodium, two of nitrate of potassa, and one of carbonate of soda. The filtered aqueous solution of the fused mass was acidulated, precipitated by chloride of barium, and the sulphate of baryta, collected and weighed.

Ash.—The ash left on burning a weighed portion of the coal or coke was also determined, and its composition ascertained by qualitative examination.

Results of the Chemical Examination of Iron, and Materials employed in its Production.

A special report has been drawn up on the results of the analytical examinations of each set of samples received from the various works.

To facilitate a comparison between the composition of the irons, ores, &c., tabulated statements have been prepared, of the following description:—

Table I. embraces the numerical results obtained in the examination of the samples of iron.

Table II. exhibits the per-centages of the most important constituents of the various ores; and, Table III. includes, similarly, the principal results obtained in the examination of the fuels and fluxes.

The following are a few remarks which have suggested themselves upon an inspection of these tabulated results:—

The specimens of iron prepared from the ores of the northern district and from the forest of Dean, are remarkably free from phosphorus. This is readily explained by the very high quality of these ores, which are almost perfectly free from phosphoric acid. The considerable per-centage of silicon contained in a great number of the specimens of iron alluded to, is perhaps less easy of explanation. A reference to the composition of the specimen of Ulverston (Hæmatite) iron, given in the appendix to this report, which was smelted with charcoal, and only contains 0·59 per cent. of silicon, would appear, however, to indicate definitely that the high proportions of silicon must be ascribed to the employment of hot blast in the reduction of the iron at those works.

The products of the ores from South Staffordshire and South Wales which have been examined are, with two or three exceptions, of excellent chemical quality. Only three instances occur in these divisions of the series of iron samples (out of 26 samples from eight different works) in which the amount of silicon reaches two per cent. The samples from the Netherton and Old Hill Works (South Staffordshire), and the Blaenavon and Pontypool Works (South Wales), in the preparation of which cold blast is specified as having been employed, the silicon in only two instances (out of 13 varieties of iron) slightly exceeds in amount 1·15 per cent.

The proportions of phosphorus and sulphur in irons from the ores of this district are also inconsiderable in the majority of the samples examined. In the case of three only (out of 26) does the amount of sulphur reach to one-tenth per cent., and the phosphorus amounts to less than 0·5 per cent. in 20 instances; of the other six, three contain less than 0·6 per cent.; one from the Old Hill Works contains 0·63 per cent; and two samples from Brierly Hill Works contain 0·63 and 0·72 per cent. The ores employed at the latter works contain somewhat higher per-centages of phosphoric acid, the effects of which on the composition of the iron produced are, therefore, clearly traced. The per-centages of phosphoric acid in the ores used at the Old Hill Works (particularly in the "Balls," Bilston) are also higher than those in most of the ores used at the remaining South Staffordshire works, and its influence on the quality of the product is, to some extent, shown by a reference to the composition of some of the irons from those works.

That the proportion of phosphorus in the iron is not always determined by the proportion of phosphoric acid existing in the ore employed, need, however, be scarcely pointed out. The fact may be exemplified by reference to some of the samples of iron from the works last alluded to, and to the iron from the Lays Works, near Dudley, in which the per-centage of phosphorus is small, while the phosphoric acid in the ore is comparatively high. The circumstance that the proportion of phosphorus in all the samples of iron from the Blaenavon Works is small, while several of the ores employed contain considerable quantities of phosphoric acid, is probably to be ascribed to the employment of cold blast in the reduction of the iron at those works.

The oolitic ores and the clay ironstones employed at the works in the North Midland and North Staffordshire districts, from which specimens were submitted, as also the ochrey brown ironstones employed at the Northamptonshire Works, contain proportions of phosphoric acid, which are more considerable than those existing in the greater number of the other ores examined. Thus, the ore employed at the South Bank Furnaces contains nearly two per cent. of phosphoric acid; that used at the Stockton Works contains upwards of 1·5 per cent., and very nerly the same amount exists in one of the ores at the Butterley Works, and in that employed at the Goldendale Works (North Staffordshire). The proportions of phosphorus in the various samples of iron from these sources exceed one per cent., except in one sample from the Butterley Works, in which, however, it amounts to 0·72 per cent.

The samples of iron produced from Northamptonshire ores also contain more that one per cent. of phosphorus; the proportions of phosphoric acid in the ores are, however, not quite so high as those last alluded to, amounting to 0·84 and 1·03 per cent. The samples of iron from one of the works (the East End Iron Works) are, moreover, stated to have been produced with cold blast.

The North Staffordshire ore, used at the Goldendale Works, contains nearly 1·5 per cent. of phosphoric acid, and the proportion of phosphorus in the iron produced from it just exceeds one per cent.

A general inspection of the results obtained in the examination of the samples of ores and of the iron varieties produced from them, appears to justify the following conclusions, upon which metallurgic chemists are now tolerably well agreed:—

1. The proportion of silicon in iron is much less influenced by the constitution or quality of the ores employed than by the conditions of smelting. A reference to the composition of the Northamptonshire ores and iron samples (particularly those from the Heyford Works), indicates that under certain circumstances, among which may probably be included a deficiency in alumina in the ore or the flux employed, an ore containing much silica is very liable to furnish a highly siliceous iron.

2. The proportion of sulphur existing even in light grey pig iron is never so considerable as to exert an appreciable influence on the properties of the metal; and none of the descriptions of British ores which have been examined in connexion with this report contain an amount of sulphur compounds sufficient to exert any prejudicial influence on the quality of iron produced from them.

3. The proportion of phosphorus in iron is, in great measure, determined by the per-centage of phosphoric acid in the ore employed, while, at the same time, it is probably to some extent regulated by the temperature at which the reduction is effected (*i.e.*, by the employment of hot or cold blast.)

The various ores examined, if classed according to the per-centage of phosphorus in the iron reduced from them, would stand in the following order:—

No. 1. Northern District and Forest of Dean ores, used by the Whitehaven, Weardale, and Parkened Works.

No. 2. South Staffordshire ores, used at Netherton, Parhead, Old Hill, Lays, and Level Works; South Wales ores, used at the Ystalyfera Works; South Wales ores, smelted with cold blast at the Blaenavon and Pontypool Works.

No. 3. North Midland ores, used at the West Hallam Works.

No. 4. Northamptonshire ores, used at the East End and Heyford Works; North Stafford-

shire ore, used at the Goldendale Works; North Midland ores, used at the Butterley Works.

No. 5. Cleveland ores, used at the South Bank and Stockton Works.

It will scarcely be out of place to conclude these few remarks on the results of the analytical examinations with some notice of the very considerable difference observed in the structure of many of the samples of iron analysed, and particularly in the physical condition of the so-called graphite, as exhibited by fresh fractures of the metal. In some instances a grey iron containing a per-centage of graphite similar to, or even higher than, that in the second sample exhibited a dense compact structure, while that of the other sample was open grained, and showed the existence of the graphite in larger and distinct scales. These modifications in the structure of pig iron are so well known that they are only alluded to because it is to them that must undoubtedly be ascribed, in many instances, the apparent discrepancies (which may be noticed by a comparsion of the results included in this report) between the chemical quality of a sample of iron and the results which it has furnished when submitted to mechanical tests. It is self-evident that a sample of grey iron, compact and uniform in structure, may resist the application, for example, of a much more considerable tensile strain than one which is of higher chemical quality (*i.e.*, containing less silican or phosphorus, but of which the structure is comparatively open and irregular. There is little doubt, also, from the results of numerous experiments which have been made in this direction, that the effect of adding considerably to the strength of some kinds of cast iron by repeatedly re-melting them is, within certain limits, due to no important chemical change effected in the iron, to the gradual production of a more thoroughly uniform mass, in which the graphitic carbon has gradually undergone a material change in its state of aggregation.

BRICKHILL'S IMPROVED CYLINDER AND PISTON FOR STEAM ENGINES.

BRICKHILL'S IMPROVED CYLINDER AND PISTON FOR STEAM ENGINES.

FIG. 1.

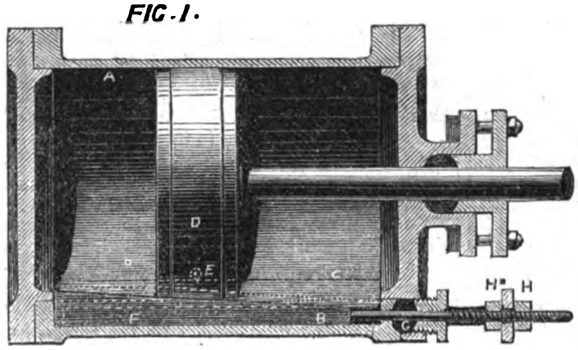


FIG. 2.

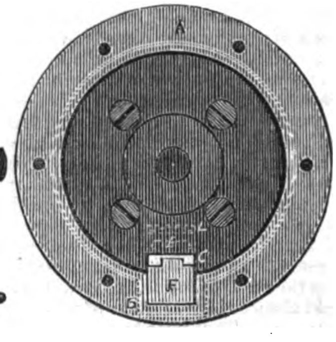


FIG. 3.

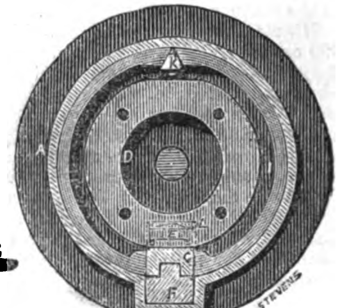
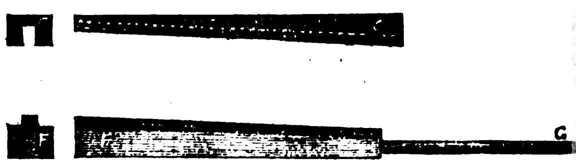


FIG. 4.



THIS invention, just patented by Mr. W. Brickhill, of Stepney Causeway, is applicable to locomotive engines, and to such stationary, marine, or other steam engines as have their cylinders placed in a horizontal or inclined position.

The object of the invention is to obviate or prevent the great friction of the piston on the lower side of the internal circumference or "bore" of the cylinder, and thereby to reduce the amount of wear, and consequent leakage to which such engines are liable, as well as to reduce the quantity of steam necessary to effect each stroke of the piston.

The improvements consist principally in forming a longitudinal groove in the lower side of the interior of the cylinder, and in placing therein a long key or "feather," on which a corresponding groove or notch in the piston works. A small fricton roller (let into the piston) runs on this key or "feather," and supports the whole weight of the piston, thus obviating the friction of the piston on the lower part of the cylinder. The under part of the key or "feather" is inclined, and a corresponding wedge is placed below the same in the groove, such wedge being attached to a rod passing out through a stnffing box in the cylinder cover, so that by forcing the wedge forwards by means of a nut on the screwed end of the rod, the whole surface of the key or "feather" may be raised perfectly parallel, to compensate for any wear that may take place.

The piston is packed by means of two half rings of metal, expanded by means of a wedge, the lower ends of the half rings embracing the sides of the key or "feather." and keeping the joint steam-tight; the upper surface of the key, or "feather" is packed by means of a packing piece sliding in a groove in the piston, and pressed downwards by means of a spring.

Fig. 1 of the above engraving is a longitudinal section through the cylinder; Fig. 2 is an end view of the same, with the bottom plate of the cylinder removed; and Fig. 3 is a transverse section of the cylinder and wedges, showing the bottom plate of the piston removed. A A is the cylinder, which is cast or formed with a longitudinal groove or trough, B B, in its under side, running from end to end. In this groove B, B, is placed a long key or "feather" C, C, on which a corresponding groove or notch in the piston, D D, works, the weight of the piston being borne on a small friction roller E, running on the key. The under part of the key or "feather" is inclined, and a corresponding inclined wedge, F F, is placed below the same in the groove, such wedge being attached to a rod G, passing out through a stuffing box in the cylinder cover. The under surface of the key, and the upper surface of the wedge, are respectively tongued and grooved, as shown in the detached views of the same. Figure 4. Upon drawing the wedge, F forwards by turning the nut, H, on the screwed end of the rod, G the whole surface of the key or "feather," will be raised perfectly parallel, so as to compensate for any wear of the lower side of the cylinder that may have taken place. H is a lock nut to hold the wedge firmly when adjusted. The piston is packed by means of two half rings, I I, of metal, expanded by means of a wedge, K, the lower ends of the half rings embracing the two sides of the key or "feather," C C, and keeping the joint steam-tight. The upper surface of the key or "feather" is packed by means of a packing piece, L, sliding vertically in a groove in the piston, and pressed downwards by means of a spring. This piece, L, may be made wider than the key, and its edges fitting into grooves in the lower ends of the half rings.

NEW METHOD OF PREPARING IRON PLATES.

AMONG the many new plans for preparing iron plates for ships' sides, may be mentioned an invention by Mr. Mattison, of the Devonport dock-yard. It has been thus described:—The first process, taking the mould for the curve of the plate, is effected by what is termed an "Ordnance box"—that is, a wide piece of iron standing on its edge, through which a number of movable bolts are placed. On the points of the bolts being fitted against the side of a ship they are pressed home into the hollows of the curve until the exact shape is obtained. They are then fastened by screws and thus rendered immovable. In connexion with taking the mould is another instrument, for obtaining the levels and curved edges of the ship's side. It is made of slight polished iron, exceedingly flexible, so that it readily conforms itself to the curve when by movable pieces of iron, crossways and lengthways, the levels are taken. The instrument, on being removed returns immediately to its original flattened shape, the edges only retaining the peculiar form given to it by the ship's side. This instrument is for the levels only, the curve of the ship's side being obtained by the other. The mould being thus taken, is transferred to the machine that actually makes the curve, which consists of a kind of iron box filled with what are termed "peppots," that is, a number of pieces of iron about an inch square and 10 inches long. These, by screws in the bottom, can also be lowered or raised, and the mould being placed on the top of these movable pieces of iron, the exact shape of the curve is secured, and the "peppots" are screwed into their proper position. Another framework, containing similar pieces of iron in a converse position, is suspended over the one already described. When the plate to be curved has to be laid on, the lower framework is drawn out on a kind of rail; the plate, after being heated, is laid on the top of the "peppots" and drawn into its former position, when, by means of a lever, the upper "peppots" are brought down with such power as to secure the reqnired shape. The model is 20 inches wide, 30 long, and 42 high. The plan is said to possess great advantages over the one now in use for taking the curves by means of wooden moulds, which are usually 3½ ft. wide, and 4½ ft. thick, and about 15 ft. long. These moulds are cumbersome and costly. Mr. Mattison's plan has been submitted to Rear-Admiral Sir Thomas Pasley, superintendent, and other officers of the Devonport and Keyham yards, who are understood to have expressed their approval of the invention. The model is to be sent to Woolwich to be tested.

DEFLECTIVE ARMOUR FOR SHIPS OF WAR.

Fig. 1.

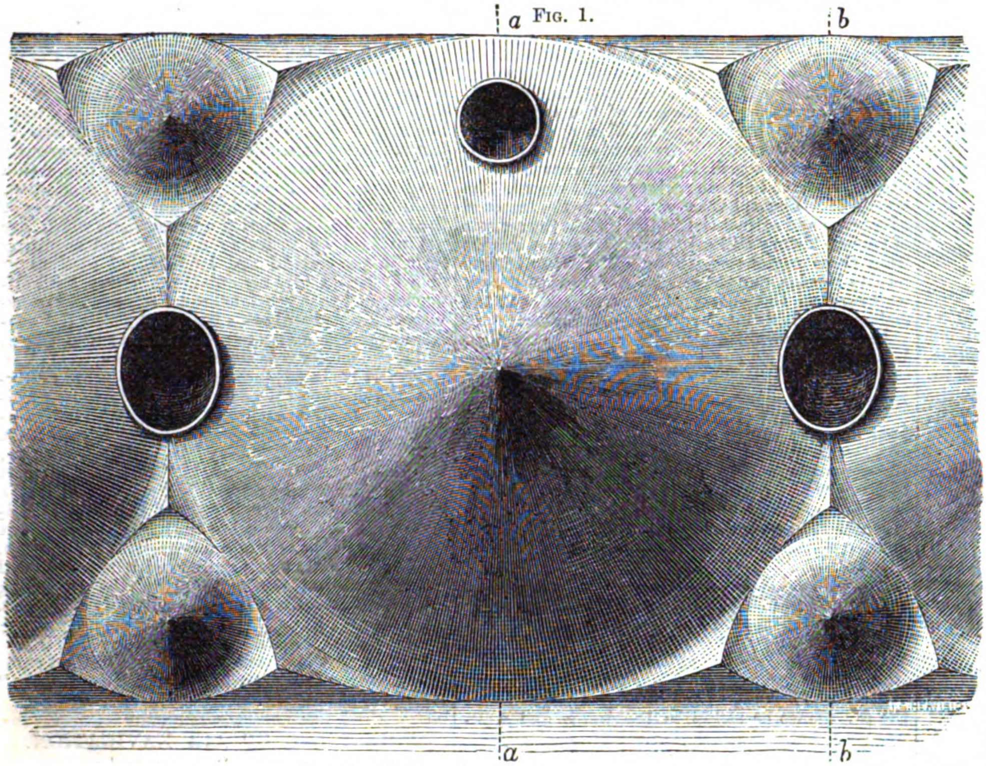


Fig. 2. Section at *a*, *a*.

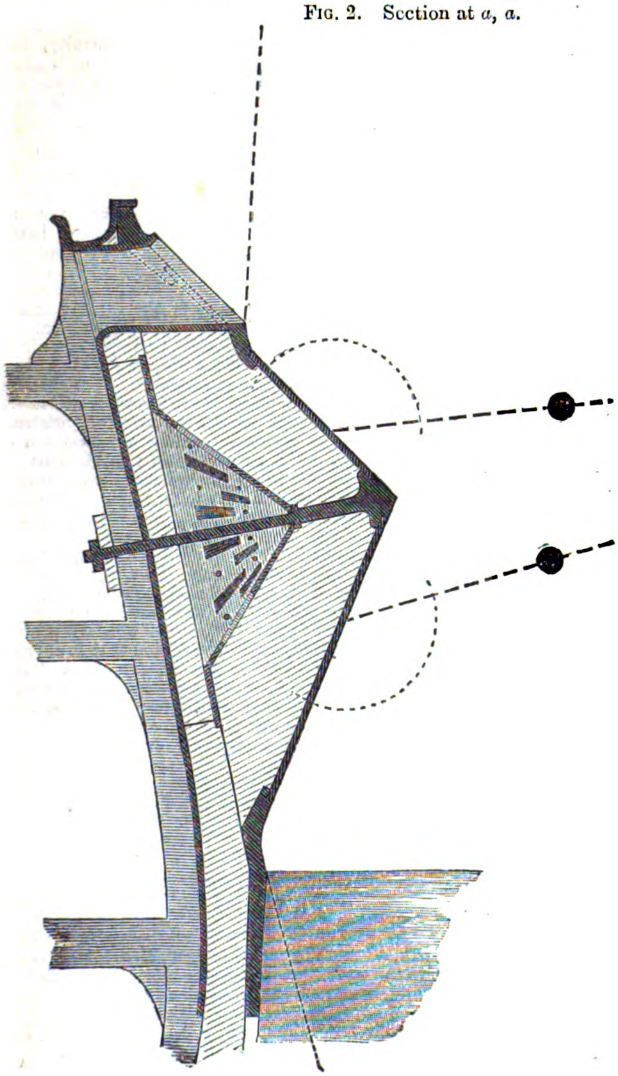
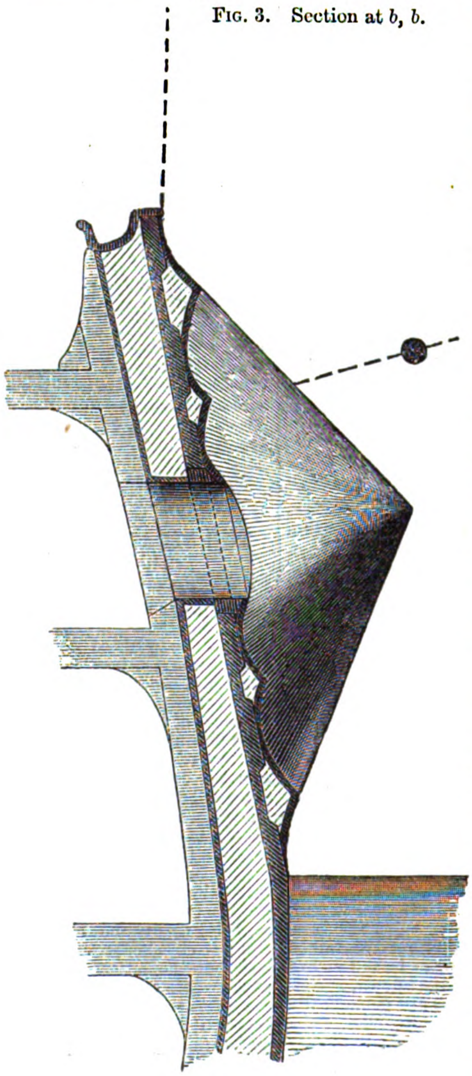


Fig. 3. Section at *b*, *b*.



TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

The late experiments at Shoeburyness should, I think, convince us that flat iron plates, of whatever thickness, are the most unscientific armour that can be used for ships of war—they receive the shot point-blank. In the second vol. of the "Transactions of the Institution of Naval Architects," published in 1862, I stated that it would be the duty of every artillery engineer officer in Europe to produce guns that will be able to crush these flat plates. The plates may soon reach their utmost thickness, while to the increased offensive power of the gun there will be no stop. However able our ships may be to meet in fair fight, in the open sea, vessels of similar description, covered alone with flat iron plates, they could not approach an enemy's fort, or enter his harbour; they would be inadequate to resist the heavy crushing effect of rifled guns, and the enormous strength of the modern artillery prepared ready to receive them.

It is a well-known fact that shot in motion are deflected in planes inclined to their course; that the more powerful the shot the more certain the deflection of it is prevented giving a point-blank blow. Your valuable correspondent, "Civilian," in page 31 of your journal, admitted this to be correct. He doubted whether the form.of armour I suggested would lessen, as I first imagined, the weight or thickness of iron. This, however, I consider secondary—the first point to be gained is the proper scientific form; this attained, after experiments, might settle the necessary thickness and weight of the shields.

The form I propose is to lay hold, to its full extent, of the principle and power of deflection. I apply the armours not in the shape of flat iron plates, but in the form of shields, of a projecting conical form, each shield having slightly-curved projecting tips, or bases, causing every shot that strikes it to glance, or deflect off in a backward direction towards the quarter from whence it came. The porthole I make either circular or oval, and place or continue the same circular tip round ,them, so that shot glancing over the surface of the shield should be deflected from them. Fig. 1 is the representation of a portion of a vessel's side, from porthole to porthole. Fig. 2 is a section of the same, at *a a*; and Fig. 3, a section at *b b*. The side of the vessel to which the shield is attached forms an angle of 85° with the line of flotation; the upper side of the shield, an angle of 45° with the same line. The black spots shown in Figs. 2 and 3 represent 10-inch shot striking the target and glancing off in the direction of the dotted lines. A shot to strike the lower side of the shield would come at a greater inclination than it

it struck the upper part; the angles, therefore, at the points struck would be about equal.

Now, it is evident that unless a shot striking the shield or target observed two conditions—its diameter being in the same plane with the diameter of the target, and its course an exact right angle to the part struck—it must glance off, whether it came vertically, straight, or oblique; whether it would deflect backward, take an inclination from the curved lip, and return like the boomerang of the Australian savage, towards the quarter from whence it came, must be subjected to proof. It would depend probably upon the greater or less projection of the lip itself; a bold projection might be struck off; a very slight one deflect the shot a mile away.

The shields might be constructed in many various ways. I do not give the present representations as the best that could be offered; but merely intend them to illustrate the principle. The projection allowed the shields would be regulated by the greater or less obliqueness of the sides of the vessel to which they were attached; where they had a bold projection, as shown in the figures, their metal covering need not be of uniform thickness. The figures show 6-inch thickness for the flat part, or lip of the shield, and 1½-inch for the projecting part; the whole being securely backed on timber, and screwed to an inner framework of iron. The shields could be made of a size sufficient to cover two or more fighting decks, placed in two lines, one above another, or dropped six feet below the line of flotation. They may be either oval or circular. The shields can be made either to form part of the construction of a ship, in combination with its framing, or they can be made so that they can be taken off and applied at will. Any alteration in the form and appearance of our present ships of war would certainly not be conducive either to their elegance, or to their sailing capabilities, and it demands more than ordinary courage to advocate any alteration. The love of the old form may be the true cause why thick iron plates, which do not injure it in any way, are used; but now that these plates are found inadequate to resist the heavy crushing power of the artillery that will most certainly be constructed to meet them, a more fitting iron construction ought to be introduced—one that will look like, and really be, a coat of mail—advancing the ship more nearly to the form and shape of the classic Roman galley. In suggesting such a form, I trust that the importance of the subject will obtain for it the earliest consideration of all interested in the question.

C. J. RICHARDSON.

34, Kensington-square.

Correspondence.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—I have read with much interest in your last number an important paper on the "Conformation of the Alps, by Professor Tyndal, F.R.S." When Professor Tyndal writes about the Alps, he arrests the attention of every one interested in geological studies; but it nevertheless appears to me that he is very far from correct in attributing the glacial period to a great elevation of the "uplifted land," and in supposing that glaciers have gradually abraded the surface to the present level.

The decrease in the level—necessary for the change of temperature causing this diminution in the size of the glaciers—would be indubitably above three-quarters of a mile in vertical measurement; and even supposing that one-half of this depression were caused by subsequent subsidence, there would remain three-eighths of a mile, or about 2,000 feet, due to the glacier action; and during such enormous abrasion all trace of the first pristine moraines would necessarily have disappeared, whereas they appear to be clearly discernible up to the present day, for they form the base on which our distinguished Professor raises his most interesting superstructure. There is, however, a theory which I have entertained for many years, and which, during at least the last fifteen, I have done my best to make known, in conversation, to such of my friends as are geologically and scientifically inclined, in order to elicit from them some objection which might lead me to modify or abandon it if it could be shown to be in any wise untenable, and as yet no one has brought forward anything that has shaken my adherence to it.

My theory (for the idea will not admit of proof) is, that in some cataclysm which, in remote ages, convulsed that volcanic strip of land which connects North and South America, that neck entirely disappeared and sunk below the sea level, leaving sufficient clear space for the passage of the entire gulf stream towards the shores of China and Russian America and Siberia. Were we to seek for an approximate era in which to place this convulsion of nature, we have in those regions ample record. The travels of Atkinson have revealed to us the traces of a foregone and extinct civilization, while the records of ancient history still exist, marking a vast exodus from those regions which, by the raising of this mighty barrier, and the reflection of the gulf-stream westward to the shores of Europe, changed the smiling cornfields into hyperborean solitudes.

Europe, meanwhile, benefitting by the change, became freed from her icy bondage, which has left its tracings and markings over the whole western portion of it.

In Ireland, England, and Scotland, erratic boulders have been found—similarly also in Norway and Denmark—evidently transported on ice-fields, where no now moving ice-fields exist. The coasts of Norway and Sweden show, likewise, the grinding marks of passing floes of ice at a higher level than is reached at present by the sea, and to a depth of incision which the sea is in the present age unable to carve.

No upheaval of the Alps alone would be sufficient to account for all this, nor is it likely that portions of the crust of the earth, so little separated as are the Alps and the coast of Norway, should be, during the same epoch, moving in opposite directions, viz., subsiding in Switzerland while rising in Norway. Whereas, as I hope, I have sufficiently shown that the divergence or reflection backwards and westwards of the gulf stream, would satisfactorily account for it all.

If doubt remain in the minds of any, I would point to the climate of the Crimea, where, though placed in far more southern latitudes, our troops experienced much greater severity of winter than our English necessities had led us to provide against; or to the streets of New York, where, though situated in a latitude 11 degrees south of London, the sledging season commences earlier and lasts much longer and more severely than is experienced in any part of Great Britain.

It would be easy, yet needless, to multiply such examples.

It is with considerable diffidence that I venture to bar Professor Tyndall's passage in a path so peculiarly his own, but having ascertained, while attending a course of lectures on Light (delivered by him at the British Institution near three years ago), that he is fallible as myself, and that he suffers under some degree of colour-blindness, and is apt to mistake purple for blue, and orange for yellow, I feel less hesitation in thinking that he may likewise have fallen into another error.

I remain, Sir,
Yours faithfully,
CHAS. GUBBINS.

28, York-place, Portman-square.
Sept. 22, 1862.

THE STRAIGHT LINE *versus* THE WAVE LINE FOR VESSELS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—As I suppose the gentleman who signs himself "Nauticus" is the same to whom we used formerly to be indebted for many practical and valuable communications, I am rejoiced to find that he has again become one of your correspondents. I am not less pleased also to observe that he is not an advocate of the wave line theory, but prefers convex lines between the light and full load water levels for the bow of a vessel; for such lines with a very fine entrance differ very little theoretically, and perhaps not at all practically, from straight lines rounded off at three-fourths of their length from the stem, in order to form with the curvilinear remaining fourth a fair junction with the side.

But Nauticus says that "wave or concave lines below the water line are indispensable, and every practical naval architect knows why." It may be so, being an instance of that subordination of principles to circumstances to which I referred in my last, but theoretically they must be as wrong there as anywhere else. I suppose, however, that Nauticus refers to a filling up of the inward angle at the junction of the stem with the hull, in order to a proper fairing of the general form, of which the iron clipper sailing ship, the "Lord of the Isles," is a very good example. But such hollowness, slight, and localized in extent to little beyond the thickness of the stem, is very different from a concavity which runs far back into the hull, encroaching on the breadth of the vessel, and necessitating a more obtuse convexity farther aft than otherwise would be the case. It is not, as Mr. Young observes, every ship "whose bow has a hollow line which is a wave line ship." But even in regard to hollowness of this mitigated sort, might it not be advantageously avoided by allowing a greater retreating inclination to the stem, thus lessening the extent of dead wood, diminishing the dead weight upon the buoyancy of the bow, avoiding friction upon surfaces which are not utilized by inclosing capacity, and acquiring lines in the vertical and longitudinal sections of finer forms. I give my opinion, however, with diffidence, and with great deference to practical knowledge. Undoubtedly this large and nearly flat surface at the bow serves to retard lee way in a vessel, and it cannot, for reasons of construction, be allowed to project far in advance of the hull without receiving lateral support from it—hence the hollow curvilineal lines. But such surface cannot be indispensable, I presume, with steamers, which only hoist sail, I believe, with a very fair wind. I observe, too, that even the sailing yacht "America," of great celebrity, has a very retreating stem, and that the hollowness of her lines, instead of increasing, diminish with their depth below the load water line; but then her keel, by way of compensation, is very deep. If I had been more familiar with the technical terms, doubtless my meaning in the preceding remarks would have been more happily expressed.

Yours, &c.,
BENJAMIN CHEVERTON.

P.S.—In my last communication, in the last paragraph, there is an error in printing "destruction" instead of distinction.

PRINCIPLES OF AIR NAVIGATION.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—Your correspondent, Mr. Quartermain, has a pleasant way of smoothing over a difficulty, but no amount of agreeable verbiage can put a gloss upon the fact, that whilst his theoretical phantasy leads him to the conclusion that a bird's wing equivalent to a certain plane surface, acting with a certain velocity upon the air, will meet with a resistance of 1¾ lbs. an appeal to the table of experiments by Dr. Hutton informs us, in a practical trustworthy manner, that with such data the the resistance will be only one-tenth of an ounce. Until he can convict those experiments of being enormously erroneous, it will be useless to continue the discussion, and the only observation which I shall make is, that he does not appear to have understood me in regard to the purport of the experiments I proposed for his consideration and instruction. It is the alleged elastic resistance to impart on air in free space that he must attend to, and not the same under confinement and restraint. Conclusions from one set of circumstances to the other will never do. I cannot part with him, however, without protesting most seriously against a perversion of my opinions, by a rather gross mistatement of them, in reference to my admission of the possibility that compression and elasticity in air may come into play even in a free space, and with very low velocities of the moving body—an admission considerately made in order to let him down gently, as it were. But I was careful to add, what Mr. Quartermain in his quotation chooses to omit, that such "fact is not sensible and can have practical effect only in the great velocities of militarp projectiles." It was only such suppression that could give a colouring of truth to his remark, that "Mr. Cheverton's faith in his own assertions surely begins to waver." It is a duty which disputants on both sides of a question owe to truth even more than to themselves, to discountenance everything which, whether intentionally or from carelessness, is unfair—a word of very mild expression to characterize, according to my notions of polemical ethics, a large portion of controversial tactics.

Yours, &c.,
BENJAMIN CHEVERTON.

"THE WAVE LEVEL"(?)

TO THE EDITOR OF "THE MECHANICS' MAGAZINE."

SIR,—I must beg leave to differ from "Nauticus" as to the wave line, as a water line for a ship's bow having been proved to be disadvantageous *when properly applied*. The line with which he has illustrated his letter, and which he *calls* a wave line would decidedly prove to be disadvantageous.

The truth, in most things, makes slow progress; errors are readily caught at and clung to, and to bring out the truth we must repeatedly strike the right nail on the head; and I must repeat Mr. Young's words, that all concave lines are not necessarily wave lines.

"Nauticus" says, "I know of no vessel having the wave line bow which is pre-eminently fast," &c. Did "Nauticus" never hear of the "America" yacht? and does not the Duke of Sutherland's yacht, referred to by him, steam from eleven and a-half to twelve miles an hour? Will "Nauticus" have the goodness to compare the number of square feet of canvass spread upon the mere jury masts of the latter vessel, with the relative quantity of canvass carried by vessels intended to sail fast, and after doing so call her a failure?

The advocates of the wave line system are quite alive to the importance of buoyancy, and part with much less of that essential quality than their opponents suppose. A vessel is none the worse for having her buoyancy brought aft.

There are two vessels pretty well known for speed, if "Nauticus" wishes to try his hand at designing fast vessels without wave lines, and can persuade any shipbuilder to adopt his design. The vessels I refer to are the "Lyons" and "Orleans," running between Newhaven and Dieppe, built by Mr. Scott Russell, on the wave line system. I am also quite willing to design a vessel which I will warrant to go twenty miles an hour. Will "Nauticus" do the same?

I am, Sir,
Your obedient servant,
T. Moy.

1, *Cliffords Inn*, 23*rd September*, 1862.

P.S.—The following extract is taken from the *Times* of Aug. 12, 1862, and shows, in a remarkable manner, the pernicious effects of the convex bow; referring to the "Pysche," paddle despatch gun-vessel:—

"The diagrams of the indicator and expansion cards were of unusually favourable character. At full speed the ship carried a tremendous wave under her bows, while at half-speed she carried one not a quarter the size. From these circumstances it was evident that as the driving power of the engines was increased from half to full speed, so the volume of water driven before her bows was also increased. If this fact be then taken as the cause of the slight difference in the ship's speed between half and full boiler-power, then the only conclusion arrived at is,—that, had the hull of the 'Psyche' been as perfect in form and capable of doing its work as is her machinery, the ship's speed at sea would equal the speed attained at the measured mile yesterday. As it is the 'Psych' may be looked upon as an eleven and three-quarter to twelve knot vessel at sea, taking the average of weather. The engines and boilers gave the greatest possible satisfaction by their working."

SAMUELSON'S IMPROVEMENTS IN SHIP-BUILDING.

The accompanying engravings illustrate a new method of building ships or vessels, which are to have armour plates applied to their sides, recently patented by Mr. A. Samuelson, of Cornhill.

Fig. 1 shows a horizontal section of a portion of a ship's or vessel's side, coated with armour plating, wherein the upright ribs or frames of the ship or vessel, consist of a series of acute angles, formed by rivetting plates to each other and to angle iron, and which are to be arranged at any desired distance apart, the outer plating or skin forming the base line of such angular ribs or frames. Fig. 2 shows another horizontal section of a portion of the side of a ship or vessel, also plated over with armour plating, in which figure the upright ribs or frames are rectangular; the sectional angular form of the ribs or upright frames may be varied; *b b* are the upright ribs or frames, which are each constructed of sheets of metal rivetted to each other, and where necessary to angle irons, or, if preferred, the sheets may be bent at their edges so as to form flanges, in place of using angle iron at the angles where the sheets are rivetted to each other, or to the plating of which the skin of the ship or vessel is composed. The plates which are to form the armour plating of a ship or vessel are each turned up at their ends so as to form internal flanges; and where the ribs or upright frames are formed to an acute angle in section, the metal of the in-

SAMUELSON'S IMPROVEMENTS IN SHIP-BUILDING.

FIG. 1

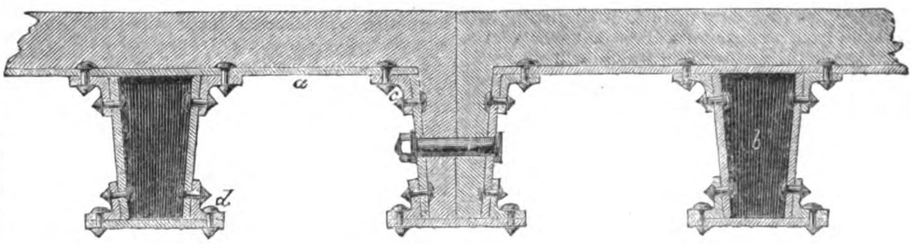
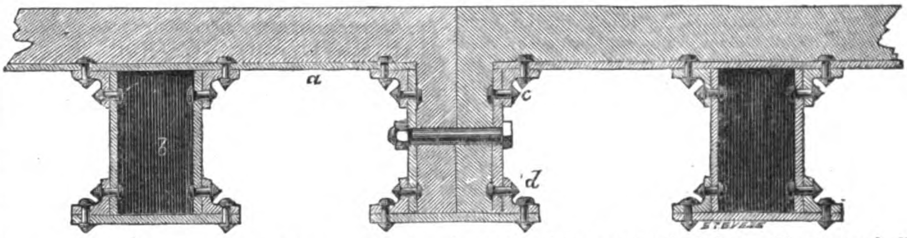


FIG. 2



terior flanges of the armour plates are bevilled, so that when the flanges at the ends of two contiguous armour plates come together within a rib or upright frame, they will fill the interior of such rib or upright frame, and the plates of such rib, as well as the flanges of the armour plates, may then be securely fixed by through bolts, which it is preferred should be screw bolts with nuts. By these means the armour plates will contribute great additional strength to the construction of the body of a ship, in consequence of the flanges at the ends of the armour plates entering the hollow ribs or upright framings of the ship or vessel, and by reason of their being fastened thereto, and to each other, whilst the use of bolts through the armour plates is rendered unnecessary. The outer skin of such vessels may be made by plating according to any of the systems of plating heretofore practised, but it is preferred that the edges of the sheets of the outer plating or skin should not lap where they are rivetted together, but that their edges should butt together and be rivetted to butt pieces, as is well understood; this however is not essential. *a* is the plating forming the outer skin of the vessel, this skin or outer plating is shewn to intervene between the back of the armour plating and the angular ribs or frames; this, however, is not essential, as the ribs or upright frames may, when desired, come directly against the back of the armour plating, in which case the skin or outer plating would be used between the ribs or upright frames; or where the ribs or upright frames are triangular in their horizontal section, they may come close together, forming a uniform zig-zag framing, constructed of plates and angle iron rivetted together; *b b* are the angular hollow ribs or upright frames which are produced by rivetting plates to each other, and to angle iron *c c* and *d d* where desired.

THE FEDERAL IRON-PLATED NAVY.

The *New York Evening Post* gives the following account of the iron-plated vessels now being built in the ports in the United States:—

"We published a short time ago an account of iron-clads building, and need only recapitulate. We have given elsewhere in this article a full account of the iron-clads in the Western waters. The other iron-clads afloat are the "Monitor," the "Galena," the "Naugatuck," and the "Ironsides." The latter is just completed at Philadelphia, and sailed from that place August 20. Her destination is kept secret. By her contract she was to have been ready July 15. Detailed descriptions of these vessels have been published. The "Monitor" has, as it were, two hulls, the upper one mailed with iron 6 inches thick, and defending the lower one, which is light, composed of three-quarter-inch iron. The upper hull is 174 feet long, and 41 feet wide. The vessel draws 9 feet; she has in the centre of her deck a revolving turret, 9 feet high and of 20 feet internal diameter, composed of iron 9 inches thick. Her armament consists of two 11-inch Dahlgren guns, fired from inside the turret. These will be replaced by larger guns. She was built at Green-point in one hundred days. The "Galena" was built at Mystic. She is not of the "Monitor" type. Her armour is 3 inches and a-half thick; she is 208 feet long, 36 feet broad, 12 feet and a half depth of hold, 1,000 tons burthen. She carries 6 guns, but is pierced for 18. The "Naugatuck" is an iron-clad canal-boat propeller, 101 ft. long, 32 ft. wide, and 9 ft. depth of hold; she has compartments by which she can be filled with water and sunk to the water's edge. The "Ironsides" is 232 feet long, 57½ feet wide, 17 feet deep, and draws 15 feet of water. She is 350 tons burden. The frigate "Roanoke" is iron-plated at the Brooklyn Navy-yard. She will have three great turrets and a powerful ram. She will be ready in about five weeks. Nine Ericsson vessels are building, which are almost exactly alike—three at Green-point, two at Boston, one at Wellington (Delaware), two at Chester (Pensylvania), and one at Jersey city. Their length will be about 200 feet, breadth 45 feet, depth 12 feet, diameter of turret 21 feet, thickness 11 inches. The keel of another Monitor has been laid at Greenpoint, different from the others. She will be 226 feet long, 48 feet wide, 13 feet deep, and will have two turrets. Reany, Son and Co., of Chester, Pennsylvania, have a contract for the construction of an iron gunboat 236 feet long, 35 feet wide, and 12 feet deep, which will be the only iron side-wheel steamer in the world. Besides these two Monitors are building at the same place. The Navy department has advertised for proposals for side-wheeled steamers of iron and wood combined. It is proposed to plate a number of them. In consequence of the singularity of this proposal several officers have been sent here by the British Admiralty to report what we consider their superior advantages. A novel vessel is near completion at the Dry Dock Iron Works, built by Charles W. Whitney. We gave a full description of her some days ago. Another vessel, on the plan of the Monitor, is building at Boston, to be 240 feet long and 1,300 tons burden. A vessel 250 feet long is under way at Jersey city for California. An iron-clad vessel will be immediately commenced at the Brooklyn Navy-yard, to be 200 feet long. The keel of another, to be 250 feet long, was laid a short time ago at the Delamater Iron Works. Captain Ericsson has recently made a contract with the Government for two immense iron-plated ships of great speed and strength. One will be

320 feet, and the other 340 feet in length. The turret will be strong enough to stand the shock of 425-pounders. Mr. Webb, of this city, has contracted to build an iron ram of immense size, to carry two revolving turrets. The plating will be solid iron, and there will be a cover of 12-inch iron on the bow, from which will protrude a solid projecting iron ram. A submarine iron propeller, built at Nearthenvy's, Philadelphia, for the Government, was recently launched. It is 65 feet long, 6 feet deep, and 5 feet wide. It is sharp at each end, and perfectly round. There is an opening for the entrance of the crew at one end. This can be closed, and the boat then sunk and moved in any direction by means of paddles, of which there are twelve on each side. There is a hole in the bottom, through which a man may pass in submarine armour. We have, therefore, the "Ironsides," "Roanoke," "Monitor," "Galena," "Naugatuck," one submarine iron propeller, and eleven iron gun-boats on the Western rivers afloat, and 12 Monitors and 10 gunboats for the Ohio river, four Mississippi gunboats, one iron-clad, at the Navy-yard, one at Boston, one at Greenpoint, one at Dry-dock, one at the Delamater Works, and one large ram building. It is stated that Mr. Ericsson has a contract for still another, which would bring the number positively built or building to fifty."

NEW ICE MACHINE.

ALL the means hitherto employed for the manufacture of ice commercially have left much to desire; some with regard to the character of the ice obtained, others with respect to the construction of the machines or the fittings; others also on account of the quality of the ice made, which is sometimes of too small density, rendering the preservation of it difficult, or else of such an aspect and odour as to make its use almost impossible.

A new inventor has just discovered and patented a system which has no longer the faults, the inconvenience and the danger of others, but offers, on the contrary, immense advantages in its construction, and in the quantity of ice it produces. The inventor is M. Lespine, who has succeeded, after many years of persevering labour, in furnishing for use machines of a rare perfection, of a simple and easy construction, always certain and regular in their action, liable to no explosion or derangement, and producing much more ice than any other system in use up to this time. The price of a machine capable of producing every hour—

20 kilogrammes of ice is	4,000	francs.
40 ,, ,,	8,000	,,
60 ,, ,,	12,000	,,
80 ,, ,,	16,000	,,
100 ,, ,,	18,000	,,

The profit (at Paris) on the rough ice is guaranteed by M. Lespine at three centimes the kilogramme. The ingenious construction of these machines offers, in addition to the advantages enumerated above, that of answering all the various purposes for which cold is required, without introducing any modification into its machinery.

The production of cold graduated at pleasure between zero and 30 degrees centigrade below zero, adapts these machines for scientific as well as commercial purposes. The different ways in which cold is used may be classed into three divisions: the 1st comprising private uses and the daily necessities of domestic life; the 2nd the preservation of public health, the salubrity and the welfare of the million; the 3rd including the various and different branches of industry.

The following summary gives fuller details of the varied applications of ice and the apparatus of M. Lespine:—

For private purposes and the daily requirements of domestic life:—

1. The production of rough ice at will, soft or hard, transparent or opaque.
2. The manufacture of sherbet and comestible ice in masses, more or less dense, iced wines, &c.
3. The preservation of meat, butter, cream, pulse, and alimentary substances in general.
4. The cooling of beverages of all kinds.

For public health and salubrity, by lowering the temperature in crowded localities, &c.:—

1. As in theatres, factories, work-shops, hospitals, ambulances and dissecting-rooms, slaughter-houses, &c.
2. By employing ice or cold in all its forms, within and without buildings, as a remedy for, and preventive of, many epidemic and endemic diseases resulting from intense heat.
3. The separation of salt from sea water, so as to render it drinkable on board, or to promote congelation.
4. Cooling the cabins of passengers and officers in ships, so as to enable them to defy the heat in the tropics in long voyages, &c.

For scientific and industrial purposes:—

1. Various preparations, and the concentration of a great number of chemical products.
2. The manufacture of essential oils, certain colours, sea salt, sugars, &c.
3. Cooling the wort of beers, and, by consequence, improving the make of beer, especially in warm countries.
4. Concentration of alcohols, spirits, and wines, and the improvement of wines in middling years, so as to admit of their keeping when shipped, &c.

M. Lespine adds to his machine a particular method of action of extreme simplicity of detail, by which blocks of ice may be formed of considerable weight with the smallest possible volume, thus rendering the preservation and transport of the ice more easy.

Gossip.

Experiments were made last week on the Tyne, for the purpose of ascertaining the capabilities of a screw steam hopper-barge, constructed by Messrs. Richardson and Co., Low Walker (the engines by Messrs. R. and W. Hawthorn), from the designs and specifications of Mr. Ure, the engineer of the River Tyne Commission. The object of a hopper-barge is to carry out to sea the sand dredged from the bed of the river, and then to let it fall through the bottom into deep waters, where there is no chance of its being washed backed again into the river. The old arrangement was to have these barges towed, one or two at a time, by ordinary tug-boats; and the object which Mr. Ure had in view in getting the present steam hopper constructed was to reduce the first cost, and the cost of working, by having the cargo of sand and the propelling power in one vessel. This has been most satisfactorily accomplished—as the vessel took out 300 tons of sand from the ballast-ground, 4 miles from the large dredger, in Shields harbour, and returned, after discharging her load, in one hour—her speed, when light, being 9½ statute miles per hour, and when loaded about 8¼. She then took a loaded hopper-barge of the ordinary construction in tow, being loaded at the same time herself, and tried her speed against one of the most powerful of the commissioners' tugs, towing one ordinary hopper-barge loaded; and under these conditions she had a decided though slight advantage in speed; that is to say, she carried 600 tons to sea in the same time as, under the old system, a load of 300 tons was carried; and, when regularly working with a barge to tow, she could load, take out to sea, and return once in every two hours and a-half; thus getting rid of 2,400 tons in 10 hours. Everything about the vessel worked satisfactorily.

A new joint-stock company has recently been formed in London, called the "St. David's Gold Mining Company" (limited), the object of which is to purchase and work an extensive grant of land for gold, silver, and copper, in the parish of Llanaber, Merionethshire, North Wales. The land proposed to be worked adjoins the Vigra and Clogau Gold Mine, specimens of the gold from which are to be seen in class 383 of the British Mineral Department of the Great International Exhibition, and the yield of which is stated to be unusually large.

A scientific balloon ascent for meteorological investigations is shortly to be made in Prussia, under the direction of the Berlin Academy, on the plan of the successful ascents of Mr. Glashier, which have excited very great interest amongst learned societies abroad. A new balloon for military purposes, which can be made to ascend or descend by a peculiar apparatus attached to the car, is stated to have been made by the French aeronaut, M. Goddard.

On the Scheldt, near Antwerp, experiments have been made with a river boat provided with a new propelling power, which has been recently discovered. The boat has neither paddle-wheels nor screw. In the middle of it, however, is a cone-shaped kettle into which the water is pumped up, and from which it is driven out with great force into the river through two curved boxes on the side of the boat, by which means the vessel is propelled forward with great swiftness. By simple machinery the arrangements of the boxes can be so altered that the boat can be turned immediately and steered in any direction. The experiments made with this boat, which is intended to ply between Luik and Seraing, have far exceeded expectation, and will perhaps cause a revolution in the means of propulsion. The new system, which has been discovered by a German, one Mr. Seiber, can be very well applied to large vessels.

The patented ship's rudder of Capt. Warren, R.N., having been experimented upon satisfactorily, by Capt. Broadhead, of Portsmouth, it is stated that the Lords of the Admiralty intend to more fully test the value of the invention, by putting it to the iron ship, Sharpshooter.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the Proprietors of this Magazine. Other Papers are hereby warned not to produce them without an acknowledgement:—

STEAM ENGINES, 622, 641, 646, 655.
BOILERS AND FURNACES, 619.
ROADS AND VEHICLES, 607, 610, 616, 639.
SHIPS AND BOATS, 629, 654.
CULTIVATION OF SOIL, 612, 658.
FOOD AND BEVERAGES, 638.
FIBROUS FABRICS, 601, 603, 613, 623, 625, 632, 659.
BUILDING MATERIALS, 608, 643, 656.
LIGHTING, HEATING, AND VENTILATING, 614, 617, 631, 650.
FURNITURE AND APPAREL, 600, 605, 615, 620, 621, 624, 630, 634, 636, 644, 645, 649, 651, 653.
METALS.
CHEMISTRY AND PHOTOGRAPHY, 640.
ELECTRICAL APPARATUS, 661.
WARFARE, 626, 637, 642.
LETTER-PRESS PRINTING.
MISCELLANEOUS, 602, 604, 606, 609, 611, 618, 627, 628, 633, 635, 647, 648, 652, 657, 660.

600. T. BOSTOCK. *Improvements in the manufacture of boots and shoes.* Dated March 5, 1862.

Here the patentee uses a block, perforated throughout its entire thickness with a hole of the size and shape of the sole, heel, or other part of the bottom of the boot or shoe, and he also employs in connection therewith two dies, male and female, corresponding in form on their adjacent upper and under surfaces with the convex surface of the bottom of the last, and accurately fitting at their edges within the perforation of the block. The piece of leather to be operated upon is cut out to the required shape and size for forming the sole, heel, or other part of the boot or shoe, the edge being bevelled, in order that the surface of the leather which receives the convex die shall be larger than the other surface. The piece of leather is then placed between the two dies and within the perforated block; and pressure being thus brought to bear upon the block, by means of a screw or weighted lever, the leather receives the required bedding to the last, and solidifying both of the surfaces and the edges at one and the same time. *Patent completed.*

601. E. PARTINGTON. *Certain improvements in the method of cleansing and preparing rags or other materials used in the manufacture of paper, and in machinery or apparatus connected therewith.* Dated March 5, 1862.

The machinery for effecting the washing and cleansing of the material consists in a chamber having its interior surface furnished with projections, teeth, or tearing points, and being spirally arranged. Within this chamber a cylinder revolves, having projections upon its periphery, also spirally arranged, and passing between the others in its revolutions; so that, by means of the propelling power of the spirally arranged teeth, the dirty material is passed through the machine in one direction, and subjected to their tearing action during its progress, the course of the washing water through the chamber being opposite, so as to meet the material in a pure state, cleanse it, and pass off through the strainer (to retain the fibrous material) when rendered unclean. When the material has passed through the machine, and is sufficiently purified, a large pronged fork is thrust into it from an opening in the side of the machine by a crank, which removes as much as it can contain, and deposits it in a receptacle provided for the purpose. *Patent completed.*

602. F. W. GISBORNE. *Improvements in the mode of indicating numerals or letters in railway tickets and other articles by peculiar devices cut therein, and in apparatus for effecting the same.* Dated March 5, 1862.

This invention is not described apart from the drawings. *Patent completed.*

603. W. E. NEWTON. *An improved process and apparatus for reducing wood, straw, and other vegetable substances to pulp, for the manufacture of paper.* (A communication.) Dated March 5, 1862.

This consists in disintegrating wood and other fibre-yielding vegetable substances for the production of paper stock, by subjecting such substances to the mechanical operation of breaking, beating, or grinding, while it is immersed in and under the chemical influences of highly-heated water, and under the pressure due to such high temperature. *Patent completed.*

604. J. BARKER. *Improvements in, and means and apparatus for, casting drums, pullies, gear, and other wheels and bushes or keys for the same.* Dated March 6, 1862.

This relates to those drum pulleys, gear, and other wheels which are fixed on shafting by conical bushes or cylindrical keys; and the object of the invention is to economize labour and reduce the cost of fitting up or of manufacturing shafting and gearing. *Patent completed.*

605. G. LAWRENCE. *Improvements in the manufacture of flesh-gloves and flesh-straps.* Dated March 6, 1862.

This consists in so manufacturing flesh-gloves and flesh-straps, that the same instruments may be used at different times, either as flesh-gloves or flesh-straps. For these purposes flesh-gloves are made in a manner very similar to that now commonly practised, but with a strap at one end of each glove; and the other end of such flesh-glove is formed so as to be readily joined or connected with its fellow-glove by buttons or otherwise; thus forming a flesh-strap. *Patent abandoned.*

606. T. HACK aud A. E. CARTER. *Improvements in screw-cocks.* Dated March 6, 1862.

Here, to avoid the use of the ordinary packing, the patentees cause the valve-spindle to terminate within the valve-case with a head suitable to receive a key. A corresponding key is placed immediately over the head, and the stem of this key, which is cylindrical, passes out through a corresponding hole in the cover of the valve case, the stem of the key fitting the hole loosely. Beneath this hole a cylindrical chamber, somewhat larger in diameter than the stem of the key, is formed in the cover of the valve case; the lower part of the key is enlarged to fit this hole, and between the top of the enlargement on the key, and the top of the cylindrical chamber, a ring of brass is placed, which is fitted accurately, both to the surfaces above and below it. The fluid within the valve case, being in contact with the bottom of the key, presses it upwards, and keeps the top of the enlarged portion of the key in close and fluid-tight contact with the brass ring; and this latter is, by the same means, kept in fluid-tight contact with the top of the chamber in the cover of the valve case; thus the escape of fluid by the passage by which the key passes out is prevented. In order to steady the screw-spindle, and to keep it truly in its place, its upper end is passed through a guide ring, screwed into the bottom of the chamber in the valve case. This ring also serves to take the upward thrust of the spindle, on which there is an enlargement immediately below the ring. The upper surface of the ring also serves to support a spring, which is employed to sustain the key should the pressure of the fluid at any time be insufficient for the purpose. *Patent completed.*

607. J. G. SHIPLEY. *Improvements in bridle-heads, reins, and bits.* Dated March 7, 1862.

The improvements in bridle-heads and reins consist in substituting studs and holes for buckles or sewing, as hitherto practised. The improvements in bits consist in making each of the checks thereof divided, or in two or more parts or pieces, for the purpose of adapting thereto mouth-pieces of different forms. Also in forming each of the solid cheeks of bits with a piece of metal having a screw formed thereon to receive mouth-pieces of different forms, the ends of the said mouth-pieces having screwed holes formed therein for connecting the same to the cheeks of the bit. *Patent completed.*

608. M. B. NEWTON. *Improvements in the manufacture and construction of junction and other drain pipes in clay or other plastic materials.* Dated March 7, 1862.

The documents relating to this invention are with the law officers under objection, and cannot at present be seen.

609. T. FARRIMOND. *An improved safety cage for mines.* Dated March 7, 1862.

Here the inventor places two horizontal shafts through the cage near the centre, and fixes on each end of the shafts eccentric levers having teeth at their extremities. The said shafts are worked by a coupling and chain connected with the main rope, and one or more springs are attached to the coupling for the purpose of turning the shafts and bringing the toothed ends of the levers forcibly in contact with the guide rods or ropes whenever the main rope breaks, and thereby hold the cage and prevent accident. *Patent abandoned.*

610. J. REVELL. *Improvements in securing the rails of railways and tramways to the chairs.* Dated March 7, 1862.

Here the inventor secures the rail to the chair by means of an improved key wedge or packing. On that side of the key next to the rail he makes a sunk or hollow bed to receive a strong, firm packing, made of hard wood or lead. The packing fits tightly in the hollow bed, and projects a little from the surface of the key, pressing firmly against the rails. On the side of the key pressing against the chair, the upper part may be in contact, or quite free, without any packing whatever, but in the lower part he sinks a rebate or groove, and in connection with it a sunken bed of dove-tail or other suitable shape, into which he places a locking or tying key, previous to the main key being driven between the rails and chair. After the main key has received the packing in the hollow or sunken bed, and also the tying or locking key, it may then be driven into its place in the same manner as the ordinary wedges are now driven; then he turns down or bends each end of the locking keys against the chair in order to keep it firmly in its ace. *Patent abandoned.*

611. J. CARPENDALE and T. MIDDLETON. *Improvements in means of producing raised chasing on copper, silver, and Britannia metal, by the application of pressure.* Dated March 7, 1862.

This invention admits of, and consists in, means for the pressure being determined and applied on an extended scale by the adjustment of the machines. *Patent abandoned.*

612. J. FOWLER, jun., D. GREIG, and R. NODDINGS. *Improvements in apparatus for cultivating or tilling land.* Dated March 7, 1862.

This consists in placing the axis or fulcrum of the balance frame below the axis of the carrying wheels. For this purpose the patentees employ by preference an axle, which they attach to the balance frame at two points across it, and at each end of this axle is a standard or slide bar on which the short axle of the carrying wheel is placed; thus it will be seen that the weight of the frame resting on its fulcrum below the axis of the carrying wheels, causes the standards or slide bars to assume at all times a vertical or neatly vertical position, and the short axles of the wheels, being attached to and centering on the standards, the locking of the wheels does not affect the general level of the balance frame. In the construction of rotary cultivating implements to be worked by steam power, they employ one or more plain cylinders or axles armed with prongs, which by their weight penetrate into the land, and this improvement consists in causing the main cylinder or axle to drive another or other similar axle or axles, also armed with prongs, at a higher velocity than that at which itself rotates; thus the main cylinder breaks up the land roughly, and the second, being driven by it at greater speed, reduces the clods to a finer and better condition. Two such axles with prongs form a cultivator to be turned at the headland, but four or more can be used with advantage when mounted on a balance frame. In constructing winding apparatus, where drums mounted on horizontal axles are employed, they sometimes arrange the boiler, engines, and windlasses so that they can turn partially round on their carriage frames, so as to adjust the plane of the drum to the line of draught. This may be accomplished by a turn plate or table, arranged so that the machinery and carriage frame can readily be fixed in such a position that the hauling rope may be led on at an angle to the carriage or carriage frame. Other similar arrangements may be made. *Patent completed.*

613. T. and W. BATT, and J. WILKINS. *Improvements in the manufacture of warp fabrics in warp machines.* Dated March 7, 1862.

This consists in a peculiar mode of arranging and lapping the warp threads of warp machinery, whereby very novel warp fabrics are produced, one surface consisting of raised pyramids, and the reverse side of corresponding cavities. For this purpose the warp threads are caused to lap, so that the fabric is divided longitudinally and transversely, so that the fabric may be said to consist of a series of square sections, which, by reason of the fabric being elastic, will, when the fabric is free, shrink, and the several sections form themselves into pyramids. The way in which the warp threads are lapped on the needles to produce these effects may be varied; the number of threads used, the size and distance apart of the pyramids may also be varied. The effects produced may also be heightened by using different coloured warp threads, and by using extra or ornamenting threads, particularly at the apex of each or some of the pyramids. *Patent completed.*

614. R. WRIGHT. *Improvements in heating and clarifying saccharine fluids.* Dated March 7, 1862.

This consists in carrying on the heating and clarifying process in vessels or apparatus, such as are described in the specification of a former patent granted to the present patentee, dated 6th September, 1860. (No. 2,153) for evaporating saccharine fluids in the manufacture and refining of sugar; but when heating and clarifying saccharine fluids according to the present invention, the revolving discs or surfaces described in such former specification are not used, the clarifying process not requiring evaporation or motion of the fluid, as when manufacturing or refining sugar, as described in such former specification. By these means of carrying on the process of heating and clarifying saccharine fluids, the bottom of the pan or vessel containing the saccharine fluid is treated by the vapour of boiling water, which is in a vessel below; at the same time the water in this vessel is prevented from coming in contact with the bottom of the pan or vessel containing the saccharine fluid, and is also prevented from using in temperature above 212 deg. Faht. by reason of the vessel containing it being constantly open to the atmosphere. *Patent completed.*

615. J. BROOK. *Improvements in ladies' dresses.* Dated March 7, 1862.

Provisional Protection has not been allowed for this invention.

616. R. RESTALL. *Improvements in apparatuses for connecting and disconnecting carriages and engines on railways, as also signal lines between guard and driver.* Dated March 7, 1862.

By means of this invention carriages may be connected and disconnected whether at rest or in motion. First, the invention consists in attaching to the engine or to the tender, or to any carriage, waggon, van, or truck a stirrup, which is hinged to a plate, a perforated rod, or wormed bar, which passes through the frame, and is connected to an ordinary draw spring, or not, as may be needed. Or the plate may be fixed, or may be connected to a tightening apparatus. The stirrup has fitted to it, and depending from it, a weighted U-shaped bar, while a double similarly-shaped bar is connected by loops to the upper surface of the stirrup; this latter bar has attached to it a cord, strap, or chain, which is carried to some part within reach of the driver, guard, or attendant, and at the side of the U-shaped bar is placed a flat bar, with a sliding loop for connecting and disconnecting a signal between guard and driver; the carriage to come next to that carrying the stirrup is fitted with an ordinary draw hook, or to one or other of the connecting hooks described with reference to the drawings.

To connect the coupling side chains, it is necessary an attendant should hook them on, but there is no necessity for him to enter between the rails, as the hooking on should be performed outside the rails on each side. In order to tighten up the coupling, whether the stirrup or any other coupling, the patentee connects to the plate which carries the stirrup, a rack, which passes through the front or back frame, as the case may be. This rack is geared into by a pinion, which is worked by a handle either directly or through a worm and wheels, or a wheel working on a worm, and the connections are so made as to admit of the stirrup bar being moved outwards or inwards as may be required. The invention also consists of a connecting and disconnecting apparatus, formed of a spiral spring draw bolt, which is raised to release a coupling, or lowered to effect and retain the coupling. The invention also consists in forming a looped hook at the end of each of the side chains, and in carrying a chain, cord, or band within reach of the driver or attendant, so that when required, by pulling on a cord, the chains can be released. He employs a separate looped hook for each side chain. He sometimes hinges on to a plate bolted to the engine, tender, or carriage a weighted looped hook, to receive one end of the side chain or other coupling, and he attaches a line, cord, or chain to the hook in such manner that, on the hook being pulled up, the chain will be liberated. *Patent completed.*

617. T. H. WOOD. *Improvements in apparatus employed in the manufacture of Artificial Fuel.* Dated March 7, 1862.

This invention was described and illustrated at page 163 of the present volume of this journal. *Patent completed.*

618. H. B. COATHUPE. *Improvements in the manufacture of clips, hooks, and other such like fastenings.* Dated March 7, 1862.

Here the patentee proposes cutting or stamping the hooks or clips out of sheet metal, in the form of the letters H. I. Y. or X., and folding such Y pieces when separated from each other (or a series of such pieces in combination), by which one end is formed into a spike or nail, whilst the other can be used to clip or hold the tube, and either to encircle the tube, or only partly so, as is now done by what is known as the gas hook. The right and left hand arms of the X pieces are intended to be turned in two opposite directions, thus presenting a forked piece, to be driven or fastened to wood, or any other material, and another to hold the tube or pipe. *Patent abandoned.*

619. A. W. WILLIAMSON. *Improvements in apparatus for generating steam, or for generating and superheating steam.* Dated March 8, 1862.

Here the patentee uses a number of tubes of moderate diameters, either made by drawing or welding, when they have to stand a very great internal pressure, or formed of rivetted plates, when used for lower pressures, which tubes will afford considerable strength with only a moderate thickness of metal. Each of these tubes is made to act as a steam boiler, or combined steam boiler and superheater, being so arranged in a slanting position, that the water contained in the same is at one end, and the steam at the other, or chiefly so. These boilers are connected together at their lower ends by tubes of greater or less diameter, or size, through which they are supplied with water. In order to give stability, these boilers are firmly fixed at the lower end, and are only so far supported or confined at the upper end, to prevent inconvenient movement, but not to prevent or impede their lengthening, or expansion. The rigid connection at their lower end is effected by a direct connection to a foundation, without putting any strain on the connecting pipes supplying the water; or the boilers are firmly attached to connecting pipes, strong enough to hold them securely to the foundation. The steam is taken from the upper end of each of these boilers by a curved pipe of copper, or thin iron, sufficiently long to admit of its yielding, without injurious strain, to the expansion of the boiler. These small steam pipes open into larger ones, which convey the steam to wherever required. The furnace is so arranged that the flames first strike against the lower part of the boilers containing the water, and pass through spaces left between them, either directly to the flue or uptake, or else to the upper part containing the steam, which, by this means, becomes superheated. The connecting pipes supplying the water are so arranged as to be protected from the heat of the furnace. *Patent completed.*

620. H. FLETCHER. *An improved clip for securing the steel or other expanders of crinolines to the suspenders thereof.* Dated March 8, 1862.

This consists in forming a clip with slits or holes therein, through which are passed the suspenders of the crinoline, and likewise the steel or other expanders, or the expanders may be otherwise connected thereto. By these means the clip cannot possibly become detached therefrom accidentally. *Patent abandoned.*

621. G. EDMONSON. *Improvements in washing machines.* Dated March 8, 1862.

This consists in improvements upon a former patent granted to the present patentee, dated 1st of April, 1861 (No. 798). In that machine he used a single chain for giving motion to the feeding and delivery rollers, and a number of guide rollers. He now substitutes two chains for the single chain, and drives the feed and delivery rollers independently of each other by separate chain pinions, which arrangement enables the stretching pulleys to be dispensed with, and saves expense in the fitting. He uses spiral springs for exerting the required pressure upon the delivery rollers, and also dispenses with the guide rollers, unless the machine is of such dimensions as to require them. *Patent completed.*

622. A. BLAIR. *Improvements in rotatory engines.* Dated March 8, 1862.

This invention is not described apart from the drawings. *Patent completed,*

623. W. PATERSON, W. A. SANDERSON, and R. SANDERSON, jun. *Improvements in finishing woven fabrics.* Dated March 8, 1862.

The patentees claim the method of finishing woven fabrics, and producing the kind of pile thereon, by floating certain of the warp or weft threads over the surface of the same, and then breaking through such floated threads by cards or strong

tearles, and raising such broken threads into a pile, as described. *Patent completed.*

624. S. S. Bromhead. *Improvements in the construction of boxes or receptacles for coals.* Dated March 8, 1862.

These boxes are formed of metal or wood, or of other material, an iron grating or a plate or diaphragm composed of wirework or of perforated material being placed therein, either entirely or partially across the area of the interior of the box. Such grating, plate, or diaphragm may be placed either in a horizontal or slanting position, and has the effect of sifting or screening the coal, or of regulating the pressure thereof upon the lower chamber or compartment of the box. In order to provide for and facilitate the removal of the dust or small coal separated and collected by the agency of the said grating, plate, or diaphragm, a mouth-piece or aperture, with or without a removable cover, as may be desired, is provided at the lower part of the box, such mouth-piece or aperture admitting of the introduction of a slice, scoop, or shovel. *Patent completed.*

625. J. Platt and W. Richardson. *Improvements in machinery or apparatus for cleaning from seeds and for carding cotton, such improvements in carding being also applicable to other fibrous materials.* Dated March 8, 1862.

This relates to that machine for cleaning cotton from seeds known as the Mocarthy gin. In such arrangements a reciprocating blade is used, working in conjunction with a fixed blade and roller. According to this invention the patentees use two reciprocating blades, coming into action alternately. *Patent completed.*

626. J. Deane, jun. *Improvements in revolving fire-arms.* Dated March 8, 1862.

This invention was described and illustrated at page 178 of the present volume of this journal. *Patent completed.*

627. W. N. Wilkins. *Improvements in the manufacture of pigments for oil and water colours.* Dated March 8, 1862.

The object of this invention is the manufacture of white pigments to be mixed with oil and water, as hereafter explained, to supersede white lead and other pigments now used by painters, decorators, artists and others, in laying on colour on pictures, wood, stone, and other materials requiring to be painted. The inventor manufactures his white pigment for oil painting of equal parts of white oxide of zinc and plaster of Paris, chalk, or any white aluminous earth, such as kaolin and pipeclay. He does not limit himself to the proportions stated, as a third, or even less, of the white oxide of zinc with plaster of Paris will give a brighter result, though more difficult to work with the brush. He manufactures the white pigment for water colour by mixing plaster of Paris with size or glue, in proportions according to the consistence that may be required. For grinding and mixing the pigments the machinery and apparatus are the same as those now used for grinding and mixing pigments and colours. *Patent abandoned.*

628. P. J. Guyet. *Improvements in water meters.* Dated March 8, 1862.

This invention is not described apart from the drawings. *Patent completed.*

629. S. Grick. *An improvement or improvements in propellers for propelling ships and boats and other vessels.* Dated March 8, 1862.

Here, on the end of a shaft, similar to that ordinarily used for screw propellers, to which shaft a rotatory motion is given by steam or other power, the inventor fixes a circular plate or disc, to which a hemisphere or dome is secured, by screws or otherwise, the base of the hemisphere being in contact with the said plate. On the exterior or convex surface of the hemisphere, a series of vanes or blades is fixed. The said vanes or blades are so situated on the dome, that their narrow ends meet at the summit of the said dome. The blades extend from the summit of the drum to the base thereof, the course of each blade being oblique, that is inclined to the axis of the dome. The said blades are made deeper as they approach the base of the dome, and the planes of the blades are inclined to the surface of the dome. The base of each blade may be secured to a flange at the base of the dome. *Patent abandoned.*

630. W. Clark. *Improvements in brims and peaks of hats, caps, and other coverings for the head.* (A communication.) Dated March 8, 1862.

This relates to shades or peaks for caps and other like coverings for the head, which is applicable also to the brims of cloth, silk, beaver, straw, and other hats; and consists in fitting the hat or cap peak, or brim, to receive a miniature looking-glass, comb, pencil, &c. *Patent abandoned.*

631. W. Palmer. *Improvements in the manufacture of candles.* Dated March 8, 1862.

This consists in combining tallow, cocoa-nut oil, or palm oil, or products obtained from these, with those fluid mineral oils which filter or run, or are obtained by pressure from American or rock oil, or rangon tar, or earth, or similar natural mineral oils, which retain their fluidity at the ordinary temperatures of this country. It is preferred that these oils should be in a purified state when used. *Patent completed.*

632. J. Fleming. *Improvements in machinery for pressing cotton.* (A communication.) Dated March 8, 1862.

Here a mechanical or lever press is combined with hydraulic apparatus, so that the lever press performs with speed the first or earlier parts of the dressing process, and the hydraulic pressure comes into action when the lever press ceases to act, the lever press being so arranged that at this time it will be in the most favourable position for resisting the pressure exerted by the hydraulic apparatus. *Patent abandoned.*

633. F. W. Gisborne and H. Wickens. *Improvements in the means of indicating the pressure of fire-damp or choke-damp in mines, and of dispersing fire-damp, and also of telegraphing in mines.* Dated March 8, 1862.

The fire-damp or carburetted hydrogen gas which is generated in a coal mine is of less weight or specific gravity than the atmospheric air, and the choke-damp or carbonic acid gas in a mine is of greater weight or specific gravity than the atmospheric air, and this invention consists in the use, in combination with suitable apparatus, of those relatively lesser or greater weights to connect an electric circuit, and thereby cause the required indications or signals to be given. *Patent abandoned.*

634. L. R. Sykes. *Improvements in gloves.* Dated March 8, 1862.

This relates to a novel method of applying purses or money receptacles to gloves, either for ladies' or gentlemen's wear. The inventor proposes stitching a piece of kid or other suitable elastic material of convenient shape or form on the outside of the palm of the glove, one end of which is to be left open and provided with an elastic fastening, or a suitable tongue or metal fastening. There are other modifications. *Patent abandoned.*

635. F. R. Newton and H. Codd. *An apparatus for indicating and measuring the flow of liquids.* Dated March 8, 1862.

This consists in a method of indicating and measuring the withdrawal of liquids from casks or other vessels by means of apparatus in connection with, and operated by, the ordinary beer engines or other means. The apparatus consists of two plates of metal, bolted or pinned together, leaving a space between them for the arrangement of a series of cogged wheels and pinions, similar to the manner of clockwork, the one working the other, and actuating a series of pointers, hands, or indicators, travelling on centres around the faces of dials in front of the apparatus. The dials are provided with numbers, the front dial indicating from units upwards, the second indicating tens, and the third hundreds; or the first pence, the second shillings, and the third pounds, according to the number of teeth in the various wheels and pinions. *Patent completed.*

636. J. J. H. Gebhardt. *An improved fastening for albums and other books, bags, reticules, and other articles.* (A communication.) Dated March 8, 1862.

This consists of a sliding or travelling piece fastener, in which are spiral springs acting in connection with certain studs or stops, and a knob or finger-piece. The travelling piece carries a hook, catch, or holding part, intended, when the fastening is closed, to engage in an eye, wire, staple, recess, or equivalent therefor. *Patent abandoned.*

637. M. A. F. Mennons. *Certain improvements in breech-loading fire-arms.* (A communication.) Dated March 10, 1862.

This invention is not described apart from the drawings. *Patent abandoned.*

638. J. Duncan. *Improvements in the manufacture of vinegar.* Dated March 10, 1862.

For the purposes of this invention weak saccharine liquors, consisting of what are known as charcoal-washings or char-washings, steamings of casks, bag filter washings, and the setel washes of sugar refiners are used. These are mixed together so as to form saccharine solutions of not higher specific gravity than about 30° Beaumé. As these solutions are almost invariably acid, they are neutralized, or even rendered slightly alkaline, by adding to them a suitable quantity of caustic lime, slaked lime, or carbonate of lime in a state of minute division; baryta, strontia, whether caustic, slacked, or in the state of carbonate, may also be used, though preference is given to the lime, its hydrate or carbonate. These neutralized or alkaline saccharine solutions are then introduced into suitable fermenting tuns, where they are mixed with a suitable quantity of ordinary yeast, and sometimes with German yeast in the state of cream. The solutions are kept at a suitable temperature till the various fermentation is completed. *Patent abandoned.*

639. C. Massi. *Improvements in means and apparatus for retarding and stopping carriages used on railways or common roads.* Dated March 10, 1862.

Here the inventor takes a carriage, to the tyres of the wheels of which the ordinary blake block is applied and fixed in the usual way. To the other end of the lever actuating the brake block, or to another lever, keyed, or otherwise fastened on to a shaft, when two or more wheels have the brake applied to them. He fixes a keeper, which is attached thereto by screws or rivets, but he prefers to arrange it so that the keeper shall be capable of adjustment when desired. Opposite to this keeper he places a horse shoe magnet of soft iron, with a copper coil outside thereof, constructed in the way now well known and practised in the manufacturing electro magnets; one end of the wire coil is attached to the galvanic battery, and whenever the apparatus requires to be used, the other end of the coil is brought into contact with the battery in like manner. The effect of this is, that as soon as the soft iron horse-shoe is magnetized, the keeper attached to the brake lever is forcibly drawn towards it, and the brake forthwith presses against the circumference of the wheel, with a degree of power proportioned to the strength of the magnet, thereby retarding or stopping the carriage. *Patent abandoned.*

640. R. A. Brooman. *Improvements in producing, by the aid of photography, copies of maps, charts, plans, and drawings.* (*A communication.*) March 10, 1862.

This invention is for the production by the aid of photography, of copies of charts, plans and drawings of the same size as, and without destroying or injuring the originals. The invention is applicable to line drawings, washed or coloured, or not, and to the reproduction of written or printed music, and this without a negative, which is required in all other methods of working photographically. The invention consists:—First: In tracing on transparent drawing cloth, the design, map, chart, plan, drawing, and other impression or device to be reproduced; the cloth preferred is "Husson cloth," but any other description of transparent cloth capable of receiving an equal tension on all sides in the frame used to pull the negative proof, may be employed. Second: In taking a sheet of paper sufficiently strong that it will not be liable to be torn during the several manipulations in albuminizing it, and preparing it with azotate of silver, in the proportion of about 1 part by weight, to 5 parts by weight of water. This paper is substituted for ordinary plates (clichés). It will be understood that plates are thus obtained much larger than glasses prepared with albumen or collodion could afford. The inventor prepares the stone in such a manner that fatty bodies do not adhere to it, that is, those fatty bodies generally used in lithography. The stone is coated, in a dark chamber, with a varnish composed of organic matters, and of chromate or bichromate of potash, or ammonia, When the stone has become dry in the dark chamber, he places the paper or positive plate upon it, with the design in contact with the stone; on this he places a sheet of glass, to keep the design in contact with the stone; he then exposes the whole to the action of light, say from 1 to 15 minutes, according to the intensity of the light. He returns the stone to a dark chamber, and washes it with white wine, or other liquid capable of attacking the soluble parts of the varnish, may be employed. All those parts of the varnish which have been preserved from the light by the lines in the design are soluble, and are removed by this first washing. He washes the stone with water, to thoroughly clean the spaces produced in the varnish by the action of the white wine. The washing with the white wine must be effected lightly, else the varnish will be removed throughout, and the impression will not be good. After this operation, the stone has the design on it, and the rest of its surface is covered with varnish. The stone being perfectly dried, he passes over it soapy water, and then dries it. He again washes with clear water and inks the stone with the ink hereafter mentioned, which only takes on that part not protected by the varnish; he then removes the whole of the varnish, and the design is in black, on the white ground of the stone, which is damped, inked with transfer ink, and acidulated. The impression is left 24 hours. Stones prepared in this manner are capable of yielding many impressions by the means employed in lithography. *Patent completed.*

641. W. Parker and G. H. Batman. *Improvements in steam engines.* Dated March 10, 1862.

This consists in providing cylinders with double pistons held firmly together by a strong connecting plate or arm, in which the crank pin is caused to take, through the intervention of a slat opening therein, so as to work and thereby communicate direct rotary motion to the driving shaft, the said cylinders being formed or furnished with suitable side openings for the reception of the cranks, shaft, and bearings, as also small friction rollers used for facilitating the movement of the slide valves. *Patent completed.*

642. W. Spence. *Improvements in projectiles.* (A communication.) Dated March 10, 1862.

This consists in forming the projectile, in two or more sections (by preference?) so put together that they will separate when fired from a gun, the front section striking directly the object at which it is aimed, and the hinder section or sections diverging a little, and striking near the point struck by the first section. *Patent completed.*

643. W. J. Bennett. *An improved solution or preparation to be used with Portland and other cements for the production of artificial stone, or for building purposes.* Dated March 10, 1862.

Here the main object is to expedite the setting of the cement, and thus to permit of the speedy removal of the casts from the moulds. This the patentee effects by introducing into the water, used to saturate the cement and bring it to a plastic state ready for moulding, a fluid compound consisting of a solution of carbonate of soda or its equivalent with sal ammoniac and alum. *Patent completed.*

644. A. C. MacLeod. *Improvements in ventilating hats and coverings for the head.* Dated March 10, 1862.

The object of this invention is effected by apertures or tubes in the body of the hat, corresponding or approximating to the top of the head of the wearer, the said apertures or tubes being protected by a projecting band or fillet also provided with apertures; or, instead of any apertures in the fillet, there may be apertures in the brim, or in both fillet and brim, the apertures in the body being always necessary. *Patent completed.*

645. W. S. Nosworthy. *Improvements in upright and horizontal pianofortes.* Dated March 10, 1862.

The objects of the improvements are to bring the pianist, whilst sitting at the instrument, to the height or thereabouts of the vocalist or other artist, while such vocalist or other artist is standing on the ordinary level of the room, and to enable the vocalist to read from the copy of music used by the pianist without stooping and compressing the chest. A vocalist may also accompany himself on the instrument in a standing position without bending the body. For these purposes, in the case of upright pianofortes, the patentee fixes the pedals in the bottom door, or panel below the keys, at the required distances above the bottom of the instrument, with a raised seat and a step or footboard attached thereto. Otherwise he fixes a footboard to the instrument, which will not extend beyond the key-board, into which he fixes the pedals, so that the vocalist shall stand on the ordinary level of the room. The seat may be attached to the footboard, to fold or shift beneath the keyboard. *Patent completed.*

646. A. Barclay. *Improvements in traction engines, and in apparatus for indicating the pressure of steam.* Dated March 10, 1862.

Under one modification of this invention an ordinary tubular locomotive boiler is arranged within a rectangular framing. The engine runs upon two driving wheels of large diameter, arranged towards the front end of the engine, the backward end being supported by a single trailing wheel fitted in the centre of the framing beneath the foot plate. The pair of driving wheels run loosely on the main axle, and each wheel is driven by a distinct pair of engines, arranged on the opposite sides of the framing. The main axle extends sufficiently beyond the framing to admit of the cylinders of each pair of engines, and their connected parts being arranged between the framing and the inner faces of the driving wheels. The two cylinders on each side are bolted to brackets projecting laterally from the framing, and they are placed in a diagonal position, with their upper ends converging and directed towards the driving shafts above. The upper ends of the piston rod of each cylinder traverses in a guide cast on the cylinder cover. The piston rods of each pair of engines are connected to one of two crank shafts arranged above, each shaft giving motion to one of the driving wheels, and being quite distinct from its fellow wheel. Extending upwards from the side pieces of

the framing are two standards, in the upper parts of which, are fitted the bearings of the duplex crank shafts. One pair of engines is coupled to one of the crank shafts on one side of the framing, and the other on the opposite side, each having the usual eccentrics for reversing the motion of the engines. On the opposite, or free extremity of each crank shaft, is a pinion, which gears into the teeth of an annular wheel, formed on the inside of the rim of each driving wheel. The rotatory movement imparted to each crank shaft, causes the pinion to actuate the driving wheels, and so propel the machine in either direction, as desired. The eccentrics of each pair of engines are actuated by a pair of hand levers arranged one on each side of the fire box, similar to the ordinary locomotive engines, and connected to the eccentrics above by a suitable arrangement of a central lever and connecting links. The guiding of the machine is preferred to be effected solely by the steam being caused to check the speed of one wheel whilst that of the other is increased. The second part of the invention relates to the arrangement and construction of a pressure gauge to be used with this and other engines. *Patent completed.*

647. J. B. G. M. F. PIRET. *Improvements in lubricating apparatus.* Dated March 10, 1862.

This invention is not described apart from the drawings. *Patent completed.*

648. J. T. CALOW. *A safety apparatus applicable to cages or hoists used in mining or lifting machines.* Dated March 10, 1862.

This consists essentially of a spring or springs, and a weight or weights connected to and acting upon mechanism for gripping the slides, guides, or conductors, in case of accident, the said spring or springs having a bearing or foundation on the cage or hoist, while the weight or weights hangs or hang from or rest upon the spring or springs, so as to neutralize or counteract the tendency of such spring or springs to bring the grips into action while the cage or hoist remains suspended or supported. *Patent completed.*

649. M. HENRY. *An improvement in preparing hooks and eyes for sale or consumption.* (A communication). Dated March 10, 1862.

According to this invention, boxes, cases, or envelopes are used for holding the hooks and eyes as before, but a sample or pattern hook or hook and eye is attached to such box, case, &c., so as not to be separated therefrom by the opening thereof. For this purpose the pattern is fastened upon cardboard or other material, on the back of which paper or other substance is stuck so as to conceal the attaching thread or agent, and this is caused to adhere or is attached to the box, case, &c., which can be opened without separating the sample, and the attaching thread is connected at the back. *Patent abandoned.*

650. H. H. KROMSCHROEDER. *Improvements in gas meters.* Dated March 10, 1862.

This invention relates to that class of meters in which the measuring drum consists of a series of eccentric measuring chambers, and in which a hollow floating cylinder is within the measuring drum, and comprises a great amount of detail which we cannot devote space to here. *Patent completed.*

651. R. PEACOCK. *Improvements in the manufacture of window blinds.* Dated March 11, 1862.

Here the inventor makes use of paper made from the ordinary materials, of suitable thickness and demensions, according to the size of the blinds to be produced, and this paper is either dyed, stained, printed, painted, photographed or otherwise ornamented of the desired colour and pattern. *Patent abandoned.*

652. J. NADAL. *A Portable Fountain for water and other liquids.* Dated March 11, 1862.

Here the object is for the construction of a portable fountain, in which a constant maintaining puts in motion a number of pumps, and these cause the liquid with which the fountain is supplied to circulate through and through the jets. The motive power of the fountain is a spring capable of being wound up, as is the spring of a clock; it gives motion to a toothed wheel, which gears with and drives three, or, it may be, other number of pinions, and on the axes of these are cranks (or eccentrics; and these by connecting rods work pumps, which force the liquid through the jet or jets, which may be of any form. The liquid so formed through the jet or jets afterwards returns to the pumps, and so the action continues as long as the motive power continues, so that a very small quantity of liquid is required. *Patent completed.*

653. E. PARFITT. *A Watch Protector.* Dated March 11, 1862.

This is arranged as follows :—To the inside of the pocket in which the watch is usually carried, is fixed permanently, or connected at pleasure, a loop or ring, through which the end of the albert chain is passed, and then attached to the watch. When it is required to look at the watch, the hand must be put into the pocket and the watch lifted out. Any attempt to draw out the watch by the chain will be prevented by the loop or ring. *Patent abandoned.*

654. W. BARTER. *Improvements in apparatus for propelling vessels, and for enabling them to work off lee shores during storms.* Dated March 11, 1862.

This consists in an arrangement of apparatus, by means of which the rising and falling motion given to the vessel by the waves is made available to give the vessel a forward impulse. *Patent abandoned.*

655. E. HUMPHRYS. *Improvements in steam-engines.* Dated March 11, 1862.

This relates to that description of steam-engines in which two cylinders—a small one, into which the steam first enters, and a larger one, into which it is subsequently allowed to expand—are employed, and in which the pistons of the cylinders are connected together by a piston-rod passing through the cover or partition which separates the small from the large cylinder. The improvements consist in applying a trunk to the large piston, and a suitable connecting rod, as in ordinary trunk engines, to transmit the power from the two pistons to a crank on a shaft or axis. *Patent abandoned.*

656. O. KERAUTRET and I. KERAUTRET. *Improvements in the construction of buildings, by the use of which hewn stone and faced bricks are dispensed with in some parts thereof.* Dated March 11, 1862.

This consists in moulding in the position they are to occupy all the architectural forms to be given to the building. The patentees use ordinary rough unhewn stone, which they bind together with good cement mixed with sand. *Patent completed.*

657. E. G. CAMP. *Improvements in brushes or apparatus for brushing.* Dated March 11, 1862.

This apparatus for brushing is specially designed for brushing the human hair in a new and improved manner, and is intended especially for the use of hair-dressers, but is also applicable for use in baths as a skin brush. The apparatus consists of a shaft, with a loose handle at each end, a fixed pulley for receiving motion, and a drum on which the brushes are mounted. In the manufacture of these brushes the patentee takes the materials now usually employed for that purpose, viz., bristles, split whalebone, and metal wires. When metal wires he magnetizes them or not while in use. For the purpose of causing these brushes to rotate, he drives them by a belt passed round the pulley on the brushing apparatus, and round fast and loose pulleys driven by hand or by steam or other power. To use the brush he holds the apparatus steadily with both hands, and directs it to any and all parts of the hair, in whatever position the head may be held, the brush being made to rotate all the time. For the convenience of washing he fastens the brushes to the drum by springs which admit of their being removed. The drum itself is not fixed to the shaft, but slides off and on, and is carried round by a lock and key adjustment. *Patent completed.*

658. C. HALL. *Improvements in implements for breaking up the soil, and in ropes and drums to be employed in the cultivation of the soil by steam.* Dated March 11th, 1862.

This invention consists, first, in constructing implements for breaking up the soil, as follows:—The patentee takes a sharp-cutting steel bar, of any convenient width, set at an angle to the line of draught, whereby the depth this cutting-bar travels under the surface is regulated. He screws into this bar, at intervals, sharp cutters, which direct the soil, and at the same time raise the weeds and roots to the surface. According to the shape of the cutters so will the soil be turned. Hitherto wire ropes have been used for drawing implements in steam agriculture, and they become soon worn, and possess other defects. Now, the second part of this invention consists in constructing ropes, as hereafter described, which he substitutes for wire ropes, and he uses with these ropes, drums, which he constructs as also hereafter described. He takes bars or rods of steel, or iron, though he prefers steel, and of a length determined by the length of the divisions of or on the drum, and he unites the bars or rods by means of short links, or by means of eyes, through which a pin is inserted; or he employs any other suitable means of junction. He forms the drums with the periphery divided into parts; the length of each separate part corresponds with the length of the bars or rods in the chain to be used with it, with a space or provision for the reception of the link or joint between every two bars or rods. For instance, the drum may be composed of three sides or divisions, the surfaces of which may be flat or curved for the bars or rods in the rope to bear against, or be received upon, while the links or joints would be received upon or in the parts forming the ends of the divisions. Again, the drum may be circular, with sunk recesses for the reception of the connections between the ropes. Drums made according to this invention will, in every case, have a direct grip upon the ropes constructed according to this invention, the drums and ropes being calculated to be used together. *Patent completed.*

659. T. B. WILSON. *Improvements in means or apparatus for the splitting of cane and other fibrous substance.* Dated March 11th, 1862.

For splitting cane in the direction of its length the patentees employ rollers in pairs, with grooves around them; and in front of these rollers, opposite such grooves thereof, they place knives or cutters in positions and of forms adapted to the number and form of the divisions desired to be produced. By causing the rollers to revolve, and passing the cane or other fibrous matters to be cut in the ground channels in them, the rollers will conduct the cane or other matter to the cutters, and the desired separation will be effected. *Patent completed.*

660. H. BAYNES. *An improvement in bankers' cheque-books.* Dated March 11th, 1862.

This consists essentially in inserting in the ordinary cheque-book a leaf containing a suitable form of order or request to the banker for a new cheque-book, which order or request must be signed by the same party, and in the same manner as a cheque would be signed. *Patent abandoned.*

661. R. SMITH. *Improvements in telegraph posts.* Dated March 11th, 1862.

This relates to improved modes of forming and combining a number of short lengths to form each telegraph post. The top length is of wood, and the bottom length entered into the ground is tubular, and usually of cast-iron, whilst the intermediate lengths are tubular, and usually of thin malleable iron. The separate lengths are made slightly tapering, and so that the top of one may fit inside of the next above it, like a spigot and faucet. The lowest malleable-iron length is fixed upon the cast-iron bottom length by means of pinching-screws, which are entered through an external ring. The spigot, or small end of each malleable-iron length, is by this invention formed with an indentation or corrugation running round it, to give it sufficient strength to sustain the portion of the post above it. *Patent abandoned.*

PROVISIONAL PROTECTIONS.

Dated May 12, 1862.

1426. C. J. Neale, High Oakham, Nottingham, gentleman. Improvements in apparatus for measuring and registering corn and other grain.

Dated June 20, 1862.

1816. J. B. T. Detuncq, Quesnoy le Montant, France, farmer. Improved apparatus or machinery for treating flax or hemp.

Dated June 21, 1862.

1835. H. Gonnon, Saint Nazaire, Loire Inférieure. Improved machinery for making bricks.

Dated June 26, 1862.

1878. J. Martin, Rue de Bordeaux, Perigueux, France, engineer. Improvements in reaping and mowing machines.

Dated July 21, 1862.

2071. W. E. Gedge, 11, Wellington-street, Strand. Improved excavating or boring apparatus. (A communication.)

Dated July 28, 1862.

2129. C. W. Eddy, 8, Warwick-terrace, Belgrave-road, Hanover-square. Improvements in the means of impeding the entrance of ships and vessels, and in particular of screw ships into channels.

Dated July 29, 1862.

2146. J. Mackenzie, of Arundel-square, Islington, engineer. Improvements in shaping machines for curvilinear surfaces.

Dated August 1, 1862.

2183. R. Nurse, Machen, near Newport, and D. Nurse, Pontymister, Monmouth. An improved annealing pot.

2185. C. H. Plevens, Dunstan-hall, Derby, colliery owner, and H. Rider, Rotherham, York, colliery engineer. Improvements in the construction of colliery waggons, tubs, or corves, and in apparatus for tipping or discharging the same.

Dated August 5, 1862.

2197. J. Higgin, Manchester, manufacturing chemist. An improved substitute for cow dung used in printing and dyeing texile fabrics or yarns.

Dated August 7, 1862.

2212. F. H. M. C. D. C. De F. de Lacombe, Paris, gentleman. Improvements in the means of lighting towns or other localities, and of ventilating, warming, and providing the same with water.

Dated August 9, 1862.

2232. J. J. H. Gebhardt, Lawrence-lane, City, merchant. An improved fastening for purses, pocket-books, needle-books, ladies' companions, instrument cases, and other similar articles. (A communication.)

Dated August 18, 1862.

2317. J. Brière, Brussels, Belgium, mechanician. A continuous self-acting condenser, being a new boiler-feeding apparatus.

2327. W. Whittle, Smethwick, mechanical engineer. Improved machinery for the manufacture of nails and spikes.

Dated August 20, 1862.

2329. H. Whittaker, Church, near Accrington, Lancaster. Improvements in healds or heddles, and in the manufacture of the same.

Dated August 23, 1862.

2354. J. Edwards, 77, Aldermanbury. Improvements in the permanent way of railways.

Dated August 26, 1862.

2362. H. R. Hughes, 31, Mottram-street, Stephen-street, Salford. Improvements in the construction of sawing machines.

2363. W. E. Gedge, 11, Wellington-street, Strand. Improvements in stays or corsets. (A communication.)

2364. J. and B. Harrison, Otley, York, farmers. Improvements in clod crushers.

2367. L. Jarosson, La Madelaine, near Lille, France, chemist. An improved process and machinery for bleaching or washing texile fabrics and materials.

Dated August 7, 1862.

2375. W. H. Turner, Blackburn, cotton spinner. Improvements in machinery or apparatus for carding cotton and other fibrous materials.

2376. C. Clark, 361, City-road. Improvements in tea and other trays for the table, and in urns and apparatus intended to be used therewith.

2377. G. Lindsay, Belfast, engineer and machinist. An improved mode of arranging and disposing guns in ships employed in naval warfare and otherwise.

2379. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in machinery for separating or sorting and washing coal and other minerals, (A communication.)

2381. J. G. Nutting, Regent-street, button manufacturer. An improvement in the manufacture of buttons.

2383. A. H. W. Cook, Norwood. Improved apparatus for obtaining motive power, applicable for driving machinery or for other purposes where a motive power is required.

Dated August 28, 1862.

2385. J. Kitchin, Liverpool, ventilating engineer. Improvements in ventilators.

2389. J. J. Moeckel, Rouen, engineer. Improvements in machinery or apparatus for spinning cotton, wool, or other fibrous materials.

2391. W. Husband, Hayle, Cornwall. Improvements in water valves.

2393. C. Humfrey, Suffolk-grove, Southwark, oil merchant. Improvements in the treatment of petroleum to render it non-inflammable.

Dated August 29, 1862.

2395. H. Jones, Birmingham, gun manufacturer. Improvements in breech-loading fire-arms.

2397. W. Smith, 19, Salisbury-street, Adelphi, civil engineer. Improvements in the construction of furnaces. (A communication.)

2399. H. Harben, Oxford-villa, Haverstock-hill, gentleman. Improvements in the manufacture of cotton, cotton fibre, and other similar fibrous productions.

2403. R. Courtenay, Craigton, Kingston, Jamaica. Improvements in obtaining motive power.

2405. E. A. Pontifex, Shoe-lane, City, engineer. Improvements in steam traps or apparatus for facilitating the escape of condensed steam.

Dated August 30, 1862.

2407. E. C. Harding and C. Doody, Manchester. Improvements in braces.

2411. J. Meyer, Kennington, mechanician. Improvements in mechanism for the production of Jacquard cards, and in the said cards or card bands.

Dated September 1, 1862.

2413. J. Nickson, Manchester, plasterer, and T. Waddingham, jun., architect. An improved foundation or groundwork for plaster for ceilings, walls, partitions, and other purposes.

2415. W. E. Gedge, 11, Wellington-street, Strand. Improvements in apparatus for washing the felts of papermaking machines. (A communication.)

2417. J. W. Newton Moor, Chester. Improvements in machinery or apparatus for preparing, spinning, and doubling cotton, wool, and other fibrous metals.

2421. W. Clark, 53, Chancery-lane, engineer. Improvements in the means of obtaining light and heat, and in apparatus for the same. (A communication.)

2423. J. H. Johnson, 47, Lincoln's-inn-fields, gentleman. Improvements in apparatus for regulating or controlling the working of motive-power engines, applicable also to the regulation of the flow of liquid, air, or gas through pipes or conduits. (A communication.)

Dated September 2, 1862.

2429. R. Waygood, Newington, engineer. Improvements in steam boilers.

2431. J. B. Thompson, Moreton-place, St. George's-square. Improvements in electro-magnetic machines.

2432. Sir W. O'S. Brooke, Euston-place. Improvements in the construction of submarine telegraphic cables.

2433. A. Johnston, 49, Arlington-street, Woodland-road, Glasgow. Improvements in machinery for pressing cotton and other materials, and in bands for retaining the same in bales.

Dated September 3, 1862.

2435. H. Elliott, Birmingham, gun maker. A new or improved apparatus for extracting the cases of pin cartridges from breech-loading fire-arms, and for re-capping, re-charging, and closing or turning in the said cartridge cases.

2437. G. Walton, Bradford, York, manufacturer. Improvements in circular box looms.

2439. W. Clark, 53, Chancery-lane, Engineer. Improvements in musical instruments. (A communication.)

2441. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in tools for boring, and in apparatus for working the same. (A communication.)

2442. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in apparatus for transmitting electric telegraph messages and signals. (A communication.)

2443. P. J. Bossard, Kennington-road, merchant. Improvements in stoppers for bottles, jars, guns, tubes, and other open-mouthed articles, in taps, and in fixing them in casks and other vessels. (A communication.)

Dated September 4, 1862.

2445. B. F. Cowan, Victoria Hotel, Euston-square, gentleman. Improvements in cannon and other fire-arms.

2449. R. P. Coles, Englefield-road, Islington, surveyor. Improvements in the construction of the permanent way of railways.

Dated September 5, 1862.

2451. W. Slater, Little Bolton, Lancaster, manager, and W. R. Harris, engineer, Salford. Improvements in self-stripping carding engines for preparing cotton and other fibrous substances or materials.

2453. H. W. Hart, Fleet-street, engineer. Improvements in argand and other burners.

2454. D. A. Samuel, Belvedere, Kent. Improvements in apparatus for steering vessels.

2455. J. S. Margetson, Cheapside. Improvements in the manufacture of the material intended for scarfs or cravats, and in the machinery employed therein.

2456. W. Wells, Ryder's-court, Leicester-square. Improvements in horse shoes, and in the method of fastening the same.

2457. W. E. Newton, 66, Chancery-lane, civil engineer. Improvements in lamps. (A communication.)

2458. S. H. Hadley, City Mills, Upper Thames-street. An improved process for manufacturing gas for illumination.

2459. J. R. Johnson, Stanbrook-cottage, Hammersmith, and J. A. Harrison, 25, St. Andrew's-road, Southwark. Improvements in apparatus for taking photographic panoramic pictures.

Dated September 6, 1862.

2460. S. H. Huntly, 50, Upper Baker-street, Regent's-park. Improvements in cooking apparatus, more particularly applicable to the requirements of the army and navy.

2461. J. Snider, jun., 51, Dorset-street. A new and useful method of increasing the durability of, and for preserving cloths and other like fabrics used for sails, tarpaulings, tents, and other coverings; also all kinds of ropes and cables and telegraph wires; also all woods, metals, and other materials used in buildings or constructions on land or on water; and all objects exposed to the action of acids, alkalis, gases, fire, fresh or salt water, atmospheric or other like destructive influences, by the application of graphite.

2462. S. Pudney, 37, Manor-street, Clapham. Improvements in apparatus to be used in the manufacture of sulphuric acid.

2463. H. Hughes, Homerton, engineer. An improved frilled and fluted fabric or material, and improvements in fluting or goffering machines.

2464. E. L. Duncan, Inverness-road, Bayswater. Improvements in the manufacture of splints.

2465. J. H. Johnson, 47, Lincoln's-inn-fields, gentleman. Improvements in fire-arms and projectiles. (A communication.)

2466. W. J. Curtis, Tufnell-park-road, Holloway, civil engineer. An improved construction of breech-loading cannon.

Dated September 8, 1862.

2468. C. W. Williams, Liverpool, gentleman. Improvements in steam boilers.

2469. F. D. Artingstall, Manchester, balance-maker. Improvements in balances.

2470. J. S. Crosland, Ashton-under-Lyne, engineer. Improvements in the manufacture of tubes made of copper, and of copper combined with other metals.

2475. G. Davies, 1, Serle-street, Lincoln's-inn, civil engineer. Improvements in railway signals. (A communication.)

2476. A. J. Alderman, 59, Guildford-street, Bloomsbury, gentleman. Improvements in ships' windlasses, capstans, and cable stoppers, applicable generally to hauling and working with chains.

Dated September 9, 1862.

2477. J. Webster, 142, Woodbridge-road, Ipswich. Improvements in preventing the incrustation of steam boilers.

2478. P. Rainier, The Cedars, Shirley, near Southampton, lieutenant in the Royal Navy. Improvements in watches, chronometers, and other time-keepers.

2479. J. Maurice, 3, Langham-place, Regent-street, dentist. Improvements in the construction and preservation of ships and vessels.

2480. F. Selby, Surbiton, engineer. Improvements in traction engines, and in valves for traction engines where compound engines are used, which latter improvements are applicable to compound engines generally.

2481. W. Hirst, Halifax, bookkeeper. Improvements in machinery to be employed in the manufacture of paper or linen spool tubes, which machinery is also applicable for the manufacture of cartridge cases.

2482. J. Walker, Norwich, millwright. Improvements in the manufacture of oil presses.

2483. T. Fleitmann, Iserlohn, Prussia, Doctor of Philosophy. Improvements in the manufacture of copper from copper ores.

Dated September 10, 1862.

2485. J. Saunders, 7, Mordin-place, Lewisham-road, engineer. A new or improved railway break.

2487. W. Rothera, Hollingwood, near Manchester, bolt maker and machinist. Improvements in machinery or apparatus for riveting boiler plates, tanks, and similar articles.

2489. J. Vigouroux, Nimes, France, metal founder. An inoxydable white metal suitable for making taps or cocks and other useful articles.

2491. G. Ritchie, Edinburgh, brewer. Improvements in extracting the liquid portion of yeast, spent hops, or other similar matters, and in the apparatus employed therein.

2493. A. Rigg, jun., Chester. Improvements in apparatus for carrying and tipping coal and other minerals, and in steam breaks used therewith, and with other machinery.

Dated September 16, 1862.

2536. E. Astel, Paris, France, draughtsman. Improvements in urinary utensils, also applicable to fixed and portable commodes.

LIST OF SEALED PATENTS.

Sealed September 19, 1862.

767. R. A. Brooman.
768. R. A. Brooman.
769. R. A. Brooman.
770. R. A. Brooman.
775. A. Hill.
777. E. Smith.
778. E. Field.
783. R. Kay.
785. J. Nowall.
786. J. M. Hart, and R. Lavender.
787. J. Fawcett.
788. J. Humphrys.
789. B. H. Mathew.
793. D. Abercrombie.
795. T. Fontenay.
798. J. Davis.
801. J. H. Tuck.
802. J. G. Jennings.
805. W. Holiday.
806. G. Hartshorne, and W. Woolley.
808. J. H. Brierley.
813. B. Fleet.
814. J. Topham.
816. W. Henson.
817. J. Stewart.
821. W. Beaumont.
822. A. Fryer.
824. T. Guibal.
828. W. Clissold.
830. L. De la Peyrouse.
833. J. Parker.
835. H. Nunn.
875. I. Morris.
880. W. Paterson.
899. L. B. Schmolle.
908. W. Clark.
923. G. Holcroft.
950. H. T. Hassall, and M. Burke.
952. J. C. Kay, and W. Hartley.
966. W. E. Newton.
984. E. Welch.
988. J. Watremez, and A. Klooth.
1039. H. Holland.
1074. R. A. Brooman.
1147. A. Parkes.
1149. A. Parkes.
1244. W. T. Glidden.
1490. N. Ames.
1663. J. Whitworth.
1757. A. Longbottom.
1839. G. T. Bousfield.
1844. H. Ponsonby.
1967. O. W. Child.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

1405. R. Moore. Improvements in the structure and appliances of ships and other vessels.

1407. R. Willoughby. Exhibiting and giving rotatory and traversing motion to placards, advertisements, scenes, and other objects.

1421. H. S. Firman. Washing and cleansing textile fabrics. (A communication.)

1426. C. J. Neale. Measuring and registering grain.

1438. A. Wormull. Trepanning instruments.

1440. J. H. Johnson. Purification of oils. (A communication.)

1444. W. Hartican. Fire-escape apparatus.

1445. R. A. Brooman. Shunting trains. (A communication.)

1447. W. Southwood. Machinery for manufacturing nails.

1448. R. M. Latham. Steering apparatus. (A communication.)

1456. A. Smith. Balances.

1457. E. Whittaker and J. Claro. Machinery for preparing fibrous materials.

1459. J. Smith. Thrashing machines.

1460. J. C. Brant. Construction of armour-plated ships.

1462. J. Fletcher and J. W. Fuller. Machinery for rolling, bending, and planing metals.

1468. W. Sissons. Machinery for driving piles by means of steam hammers.

1469. G. H. Birkbeck. Consuming smoke. (A communication.)

1470. J. Stone. Pumps and fire-engines.

1474. C. Tress. Manufacture of hats, helmets, bonnets, or caps.

1475. I. Baggs, and W. Simpson. Treating straw, Spanish grass, and other vegetable fibres.

1477. A. Watney. Constructing ships.

1484. A. A. Lamiable. Cementing cast and wrought iron.

1485. A. L. Thirion. Carriages.

1487. D. C. Le Souëf. Embossing metal plates. (A communication.)

1499. E. Talbouis. Knitting frames.

1501. J. Broadley. Weaving.

1524. W. Clark. Hydraulic wheels. (A communication.)

1526. M. Vogl. Protecting buildings from burglars.

1527. J. Kennedy. Propellers.

1531. J. Kennedy. Plates for plating and forming the outside skin of ships and vessels, and in protecting the same from fouling and oxidation.

1533. M. A. le B. Virloy. Drying and carbonizing wood, peat, and other fuel.

1534. W. Bush. Armour for ships and batteries.

1545. S. T. and F. Turnbull. Manufacture of floorcloths.

1556. C. de Bergue. Manufacture of metal reeds for weaving.

1558. J. Webster. Coating and indurating metals.

1567. C. de Bergue. Supporting coverings or surfaces.

1588. F. Tolhausen. Method of applying various mineral and organic substances to wire-gauze. (A communication.)

1598. J. Simpson. Cutting or producing "mouldings."

1607. J. H. Johnson. Manufacture of tinned lead pipes. (A communication.)

1645. H. Watson and J. Millbourn. Pulp strainers.

1721. F. Giachosa. Ventilating mines.

2172. J. R. and E. Ranson. Mounting mill-stones.

2176. W. E. Newton. Lubricating compounds. (A communication.)

2197. J. Higgin. A substitute for cow-dung.

2214. R. A. Brooman. Ships and vessels. (A communication.)

2287. D. P. Marques. Cleaning the bottoms of ships. (A communication.)

2328. C. Callebaut. Sewing machines.

2374. R. Sims. Machinery or apparatus for pulping, stripping, or slicing vegetable substances.

2380. W. E. Newton. Artificial illumination. (A communication.)

2413. J. Nickson, and T. Waddingham, jun. Foundation or groundwork for plaster for ceilings, walls, and partitions.

2432. Sir W. O'S. Brooke. Telegraphic cables.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2110. T. Richardson.
2113. J. Luis.
2142. A. Lamb.
2152. R. Davison.
2138. A. Manbré.
2139. W. Weild.
2193. T. Sutton.
2213. W. Hartley.
2291. W. Irlam.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2092. J. Lewtas.
2113. G. A. Biddell.
2125. W. Pollitt, and J. Eastwood.

LIST OF SPECIFICATIONS PUBLISHED

For the Week ending September 20, 1862.

No.	Pr. s. d.	No.	Pr. s. d.	No.	Pr. s. d.	No.	Pr s. d.	No.	Pr. s. d.	No.	Pr. s. d.
350	0 4	363	0 8	376	0 8	389	0 8	402	0 4	415	0 4
351	0 4	364	0 8	377	0 4	390	0 10	403	0 10	416	0 4
352	0 4	355	0 8	378	0 8	391	0 4	404	0 4	417	0 4
353	0 4	366	0 4	379	0 10	392	0 10	405	2 2	418	0 4
354	0 10	367	0 8	380	0 8	393	1 8	406	0 4	419	1 0
355	0 8	368	1 2	381	0 8	394	0 4	407	0 4	420	0 10
256	2 0	369	0 10	382	0 4	395	1 4	408	0 10	421	0 4
357	0 8	370	0 4	383	0 10	396	0 8	409	0 4	422	0 4
358	1 8	371	0 8	384	0 4	397	0 4	410	0 4	423	0 10
359	0 6	372	0 8	385	0 4	398	0 4	411	0 4	424	0 4
360	0 8	373	0 8	386	0 4	399	0 8	412	0 8	425	0 10
361	0 6	374	0 10	387	3 2	400	0 10	413	0 [illegible]	426	0 4
362	0 6	375	0 4	388	0 4	401	0 4	414	0 4		

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

TO CORRESPONDENTS.

Received:—W. A., J. H. B., T. R. S., Capt. J., E. B. J., N., J. P., R. P. E., J. H. B., Capt. N., W. A., W. B. J., B. C., W. R.

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, OCTOBER 3, 1862.

GUNS AND ARMOUR PLATES.

WHEN the mimic naval warfare at Shoeburyness is replaced by the actual conflict of iron-cased fleets, there will be a crisis in England's maritime supremacy. The best naval gun and the best naval armour will carry the day. It behoves us, then, to watch with jealous scrutiny the target experiments for testing guns and plates, which deservedly engross public attention, and make it the duty of the journalist to chronicle the results truthfully, without official or personal bias. In this spirit we propose to comment upon the trials at Shoeburyness with the Whitworth and Horsfall guns, and beg to refer to a summary of the experiments of last week from our own reporter in another column.

The reports in *The Times* of ordnance experiments are usually received by the public as authentic, and are not unfrequently referred to in Parliament as graphic and correct, so that they assume a semi-official character. We have frequently had occasion to warn our readers against placing implicit reliance on those reports, because they are usually one-sided, giving results and conclusions in an official point of view in support of the Admiralty or Ordnance departments. Of the caution with which it is necessary to receive the impressions conveyed in the columns of the leading journal, the report of the Whitworth and Horsfall experiments afford a striking example. In defiance of truth, in opposition to facts well known to the reporter, or those persons in office who furnished the data, with reference to the construction of the Whitworth 120-pounder naval gun, it is asserted in *The Times* that this most formidable and successful assailant of armour plates is "manufactured "on Sir W. Armstrong's wrought iron coil "principle, *but* with the beautiful hexagonal "bore of Mr. Whitworth's mode of rifling." This "but" is astutely meant to convey the idea that the Armstrong and Whitworth guns differ in no respect but in the rifling. This is simply untrue. The mode of construction, as described by our reporter, differs essentially in principle and in details, the results being greater initial velocity, greater power, and greater strength and security, with greater facility in loading, all in favour of the Whitworth. In the comparison of the projectiles, the Armstrong is completely outdone. Whilst the conical shot and shell of the latter, at 200 yards' range, have no penetrating force, and are shattered into atoms by impact against a $4\frac{1}{2}$-in. plate, the Whitworth projectiles of both kinds pierce the same thickness of iron through and through at 600 yards. It is true that *The Times* afterwards admits that to pierce "any iron ship the Armstrong is out of the "question;" but, without the explanation we have given, the reader of the report would suppose there is no difference between the guns but in the rifling.

The same authority then, again untruthfully, thus describes the trial of the Horsfall gun,—"this huge and most unwieldly piece "of ordnance (its weight is not less than 24 "tons) was tried at the same mark, and, as "will be seen, with very different and most "unsatisfactory results." This description we must designate as spiteful. So far from being borne out by the facts, it is a disingenuous misrepresentation. We are assured by our reporter that on the ground the performance of the Mersey gun was regarded as a great success. The effects of the one effective shot, at 800 yards, are unparalleled, and we may say unapproachable by any other piece of ordnance of any country; and when we consider its terrific destructive effects at 200 yards, at the first trial, and add the fact, that it has been fired about one hundred times, and remains as sound and strong as the day it was finished, the principle of its construction, by the test of actual practice—the best of all evidence—is proved to be good. Under this test the 150-pounder Armstrong broke down; and whatever may be said of the 110-pounder Armstrongs, it is notorious that many of them came to grief.

The inaccuracy of aim of the Mersey gun is greatly exaggerated by the *Times*. Including the pioneer, which, as with the Whitworth, was only fired to test the range, and was not intended to hit the target, four shots were fired—the first does not count. Of the other three two struck the target, so that, considering the long range (800 yards), the hazy state of the atmosphere, and the "miserable sighting," as described in our report, the practice was excellent. At the trials of the 150-pounder Armstrong, at much shorter range, it is notorious that many shots went wide of the mark, and there were as many misses, proportionally, as with the Horsfall last week. This gun being provided with proper sighting apparatus will be as accurate in aim as any other gun of the same calibre. The parenthetic note, "its weight is *no less than* 24 tons," is childish. It is an inevitable condition of a gun of this calibre to be of great weight, and it is Sir W. Armstrong's futile attempts to build up great guns of lighter weight, in contravention of this law, which is one cause of his failure. In the numerical nomenclature of guns, a fallacy is introduced by the titled Director of Artillery, which is constantly misleading the public as to the real force of guns. The proper, indeed the only true test of the power of a gun, is its bore, or, in other words, the sectional area of its powder chamber; that power, therefore, is correctly measured by the diameter, and consequently by the weight, of a spherical shot fitting the bore. That is the old and the correct method. Sir W. Armstrong has introduced the manœuvre of measuring the force by the weight of an elongated bolt. Thus he and his partizans, as an artifice to mislead the uninitiated, invariably called his 150-pounder, which burst after a few trials at Shoeburyness, a 300-pounder. By the same rule the Mersey, which is a veritable 280-pounder, that being the weight of its spherical shot, might, if fired with an elongated bolt, be called a 600-pounder. Having settled this point, we assert that no large gun of the same power as the now famous Horsfall can be constructed of less weight than about 24 tons, if it is to be a really serviceable gun, constructed, not to kill the gunners who fire it, but to produce the same destructive effects on an enemy's ships as those exhibited by the single shot which, at 800 yards, smashed a great aperture through the section which represents the side of the "Warrior." Guns to bear the explosion of 75 lbs. of powder must be of enormous weight. We think it is fairly proved that the Horsfall is the largest and best monster gun which has yet been produced, and that guns of equal power cannot be made of less weight.

Having exposed the mis-statements and erroneous assumptions of the official reports, we come to the conclusions which, for the national interest, are to be drawn from the experiments under notice. We will not now go into the question of monster guns. The uses to which they are to be applied is a matter of grave consideration. The Mersey Company have triumphantly proved the possibility of their construction and their tremendous power of destruction. We have to deal with two most important and urgent questions, namely, an improved naval gun and a shell capable of penetrating thick iron plates, which the performances of the Whitworth gun and projectiles have suddenly forced upon us, and caused no little dismay in Admiralty and Ordnance circles.

As a naval gun the Armstrong is dethroned, and the Whitworth takes its place. The millions spent at Elswick and Woolwich are wasted. A weapon far superior in every respect to the 110-pounder Armstrong is produced, and its success undoubted. The exigencies of national defence imperatively demand that the latter be as speedily as possible swept away and replaced by the former; for if this be not done, it is evident that in the event of war the "La Gloire" of our enemy, armed with 120-pounder Whitworths, would, after a short contest capture or destroy the "Warrior." Those guns penetrate the sides of the "Warrior," throw explosive shells through her iron plates on to her decks, and drive the crew from their guns as if she were a timber built ship. On the other hand, the guns of the "Warrior" would produce no effect whatever on the "La Gloire," as the conical Armstrong missiles would not penetrate her plates, or in the slightest way injure or endanger her crew. There is no denying the conclusion that plates of iron, $4\frac{1}{2}$ inches thick, with wood backing, can be penetrated by explosive missiles. The theory of the impregnability of plates to shell is demolished, and thus all the converted wooden ships are as inefficient for war purposes, as the timber-built screw steamers they are intended to replace. The "Royal Sovereigns," "Royal Oaks," and "Caledonians," are, before they are brought into life, condemned as fighting ships; and the numerous fleet of partially-protected vessels, with wooden bottoms and iron-top sides, on the Reed principle, are doomed to perish still-born. This comes of precipitancy in applying methods of armour-plating without previous experiments. This comes of adopting wood as a backing, when it ought to be known to engineers that wood offers no resistance whatever to the penetrating effect of projectiles. The Whitworth system of flat-headed shot has proved that the penetration of iron plates with cannon shot is only a punching process, familiar to every riveter and boiler-maker in an iron ship yard. Given, a thickness of plate and a punch of greater diameter than that thickness, the required amount of power must drive the punch through the plate, if it meet with no resistance at the back. Here we have the true theory of the penetration of plates by projectiles; and until wood backing is dispensed with, and replaced by a rigid backing, which shall obstruct the passage of the projectile, no thickness of plate a ship can carry will keep out explosive shells, which are the "bête noire" of naval officers and sailors. We trust the engineering world will carefully consider this subject, and aid us in opening the eyes of the authorities to the danger which menaces our maritime supremacy from the favouritism bestowed on a plausible artillerist, and the dogged persistence of the men of wood, in adhering to a bad system of armour-plating.

We warn the public that the millions which are being expended on Armstrong guns and armour-plating wooden ships are a wanton and wicked waste of the national treasure.

HOROLOGY IN ENGLAND, AND AS SEEN AT THE EXHIBITION.

It has been our task on several occasions to direct the attention of our readers, and that of the public generally, to the very important branch of mechanical science known as Horology. We have felt, and very strongly felt that although the Horologists of this country have achieved for themselves a position of eminence as regards excellency of workmanship, they have not succeeded in defending themselves from the effects of the energetic efforts made by foreign clock and watchmakers to supplant them in the markets of the world. This is a fact in every way to be regretted, and somewhat difficult to be accounted for. No doubt labour is to be had at a much cheaper rate in most of the great seats of Horological industry abroad, than in those of the United Kingdom. But, as a compensation for this disadvantage, English Horologists have at hand labour-saving machinery, and abundance of mechanical skill wherewith to direct that machinery to effective purpose, and this should place them on an even footing with their opponents, if not on much higher and more commanding ground. It does not appear however, that this consideration has as yet had its due weight with those whom it most directly concerns, and the consequence is, that in the great competition which is the result of free trade, they are out-distanced by their nimble-fingered foreign rivals.

For ourselves we shall not cease to impress upon British clock and watchmakers the absolute necessity of their availing themselves of the assistance of members of those other branches of mechanical art which are nearly allied to their own, and who have maintained their superiority over all comers. They *must*, if the declension in their trade is not to lead to its final extinction, take council of engineers and general mechanics, and employ the means, which those skilful and intelligent men would readily suggest, for enabling them to produce better timekeepers at a cheaper rate than the meretricious, and superficial importations from France, Switzerland, and America. One horologist, whose persevering employment of the printing press for the purpose of disseminating a knowledge of the asserted excellence of his wares is remarkable, and probably of much advantage to himself, has suggested the enlistment of battalions of women into the ranks of clock and watchmakers. Against this proposition we have little to urge, but we should be glad to learn whether the gentleman in question has tried the experiment himself on anything like a large scale, or on any scale at all, and whether he finds it as admirable in practice, as in theory he makes it appear. We contend for improved and multiplied mechanical appliances as the best adjuncts to horology in England, and we believe that they alone can save it, and its professors, from that oblivion towards which they are apparently drifting. It is, we need hardly assure the class of mechanists to whom these remarks are particularly addressed, with an honest and conscientious wish to serve them, and at the same time to place their useful and beautiful art on a safer basis in this country, that we tender the foregoing advice.

Let us turn now to an examination of the display of horology in the International Exhibition, and here indeed there is some ground for gratulation. If that display be not so extensive as might be wished it is at least creditable and choice. One of the principal exhibitors is Mr. F. Dent, of Charing-cross, whose name has long been honourably known in the horological world. Mr. Dent does not display in the north-east gallery any specimens of the larger kinds of clocks for the manufacture of which his house has attained celebrity, but of the smaller and portable description of time-keepers, he has exhibited several. One of them, and which is in all respects of a model character, is a chronometer clock fitted with a patent balance, which accommodates itself to extremes of temperature and thus makes the instrument independent of climatic changes. This rather remarkable exemplification of the talent of a London manufacturer chimes the quarter hours upon eight bells, is furnished with a perpetual calendar showing at a glance the days of the week and month, and phases of the moon, &c., the equation, and the bissextile. It is contained in a case of gilt bronze and glass, and as we have said, it in every way reflects credit upon its manufacturer. Of watches the same house has an excellent show of almost every kind. Perhaps the most noteworthy is what is termed their "gold observation watch." This is intended for a variety of scientific purposes, and among them the timing the transit of a star, or the phase of an eclipse; operations wherein the most delicate accuracy is required, and where the exact periods of commencement, rates of progress, and terminations must, if the observations are to have really practical value, be ascertained and registered with mathematical precision. In the observation watch the effect is obtained by having the centre seconds-hand double, one part overlying the other so as to give the appearance of a single hand in ordinary action. By pressing a knob at the pendant on commencing an observation the lower hand is instantly stopped, but the upper hand will continue in action until, as the moment of observation comes, the knob is pressed a second time. Both parts of the seconds-hand then become stationary, and the exact interval of time of observation is seen registed on the dial. The common action of the watch is not at all interfered with by the process just described. It continues going throughout, and by pressing the knob a third time the two parts of the seconds-hand reunite themselves and fly to the nearest point to correspond with the minute. For astronomical, as well as for many purposes in connexion with mechanical science, the observation watch of Mr. Dent seems to us to be admirably adapted. A gold hunting watch, also shown, posesses some peculiarities which make it worthy of notice. This is so constructed as to go two days after winding, and the time may be felt by it in the dark, or by one who is deaf and blind! A compensation balance of perfectly new construction, and which has several advantages to recommend it to the notice of the horologist, together with other excellent specimens of ingenuity and chaste ornamentation, go to make Mr. Dent's stand at once instructive and attractive.

Mr. Frodsham, of 84, Strand, who has obtained many medals for the excellent chronometers he has produced, and whose name in this particular department ranks deservedly very high, exhibits in the north-east gallery a number of clocks and watches, all of which are distinguished by their own especial characteristics. Mr. Frodsham is an inventor of no mean attainments, and one of those horologists who, imbued with a love of his art, joins with them great mechanical aptitude. It has been too much the fashion among his brethren to cleave to old forms and practices, but Mr. Frodsham, on the contrary, is ever on the alert for the creation of new combinations, and desirous of revivifying horology by injecting into its veins, so to speak, some of the life-blood of mechanical activity which circulates elsewhere. The double compound micrometic equation balance, invented by this gentleman, as well as the differential balance, also the result of his skill, are sufficient to distinguish him from the old-school horologists, whose too careful nursing has almost suffocated horology. It is not possible for us to specify all the timekeepers and parts of timekeepers shown by Mr. Frodsham. It would be unjust, nevertheless, not to mention that he has devised a new standard to facilitate universally the measurement of watches, as well as a new system of nomenclature for chronometer and watch-making. Better had it fared with the arts just named, had they numbered among their disciples more of the original-minded class of men, to which Mr. Frodsham belongs.

To Mr. Hislop, of 108, St. John-street-road, London, belongs the merit of exhibiting an admirable standard, or observatory clock, showing mean and sideral time. This, besides being an illustration of excellent workmanship, in a mechanical point of view, is so contrived as to obviate the necessity of reducing, by calculation, a sideral observation to mean time, and *vice versa*. Mr. Hislop appears to be aware of the importance of combining lowness of price with accuracy, which point, as we have said preliminarily, is of the very last importance in the emulative contest between this and other countries. As a matter of course, Clerkenwell figures extensively in other directions than that in which Mr. Hislop's clock represents it; and to Mr. Edward Danist Johnson, of 9, Wilmington-square, the public are indebted for many excellent examples of the arts of which he is so excellent an exponent. The surveying chronometer of this gentleman is so useful an instrument to the scientific man, that it would be wrong to omit reference to it here. It is so contrived as to be "portable in the pocket, as well as suitable to the navigation of a ship." None of the interesting collection of articles exhibited by Mr. Johnson have been made at unnatural expense for the sake of show, but each is a fair representation of his ordinary work; and there is no denying that that ordinary work is exceedingly well done. In a much larger way the Messrs. J. Smith and Sons, of St. John-square, Clerkenwell, are exhibitors. Their selection consists mainly of church, turret, and house clocks, all having their special and distinctive qualifications. One eight-day turret clock deposited by this firm, is the counterpart of that made by them for the government department of science and art at South Kensington. The construction is good and the workmanship excellent.

White, of 20, Cockspur-street, Pall-mall, has a rather extensive, and in some respects remarkable, display of horological instruments. Foremost among them may be mentioned a monthly astronomical clock of somewhat peculiar construction, and excellent workmanship. This is fitted with a mercurial compensation balance, and pallets jewelled with sapphires. To all appearance it is well calculated for its purpose, and it demonstrates the state of perfection to which time-measurers have been brought in this country. A series of chronometers is also shown, of various degrees of ornamentation, but all exhibiting the same symptoms of precision. The design of one of these is admirable. It has a gilt metal case, with chased columns and enriched mouldings, and is surmounted by the figure of a lion, also chased. This design is, we believe, registered, and it certainly deserves that privilege. A Gothic hall clock claims especial notice, and is a favourable specimen of the work of the same maker. There is a sumptuousness and elaboration about it which, no doubt, will recommend it to the attention of those whose

pockets are sufficiently furnished to enable them to compass its purchase. It is well suited for the hall of a nobleman's mansion, and certainly would not be out of place in one of the richly-decorated chambers of the legislation palace at Westminster. It is an eight-day time keeper in carved oak case, with columns, roof, crockets, finials, crestings, and panels in polished brass.

Of a less pretentious, yet exceedingly chaste and elegant appearance, is an eight-day clock made by Mr. White. It is of the character known as three part quarter, chiming the quarters on four bell springs, and striking the hours on larger bell springs, for the sake of increasing the volume of tone. This is encased in black wood, with chased gilt metal mouldings, the cornices being supported by variegated emblematical figures, representing the four seasons; an eagle perched on a rock, and in the act of attacking a snake beneath it, forms an admirable finish to the whole. We have by no means exhausted the list of clocks exhibited on this stand, all of which have their special incitements to attention, and most of them to commendation. In the way of watches, too, there is a profuse display. Many of these are "keyless," and one of them in particular, of the description known as a "hunting repeater," is noteworthy on account of its beautiful design, and that of the appendages pertaining to it. It is of gold, with duplex movement and compensation balance, the case being ornamented with representations of lilies of the valley. The leaves of these are formed of green enamel, and the flowers of diamonds. The chain and brooch attached to it are of the same style of ornamentation, and on the whole it forms one of the most exquisite specimens of watch work which has fallen under our observation.

Benson, of Ludgate-hill, is not behind-hand in his exhibition in the north-east gallery, although it is in other and more conspicuous parts of the building that his greatest works are to be seen. Perhaps the cheapest exemplification of horological workmanship, whether within or without Captain Fowkes' edifice, is the "everlasting shilling silent clock" of Capt. H. B. Coathupe, of Abingdon-street, Kensington. This cannot be called a *striking* example of the march of economy, but it certainly gives quiet evidence of that march, and does away with the excuse which prevents many persons from possessing time measurers, namely, their great cost.

Losada, of 115, Regent-street, and Howell, James, and Co., of 5, 7, and 9, in the same street, are extensive exhibitors of clocks, watches, marine chronometers, and astronomical pendulums. Most of these are very favourable exponents of the mechanical abilities and scientific skill of their respective manufacturers. It is impossible for us, however, to particularize them with minuteness, because to do so would be to absorb much more space than can be spared for such purpose. It would be an act of injustice to pass over without the commendation it demands, an English skeleton clock, shown by Thomson and Profaze, of 25, New Bond-street, who also show a variety of watches, clocks, time-pieces, "tell-tales," and jewellery. The clock to which we would especially refer as an instance of the blending, most successfully, art and mechanical manipulation, by the firm in question, is, as we have said, of that kind known by the name "skeleton." The clock itself is supported by two figures, exquisitely modelled and emblematic of day and night. Two other figures, one above and the other below, represent dawn and twilight. Day and night are poised upon the heads of dolphins, and the whole is supported on a stand in harmony with the general design.

Taking the Horological Department of the International Exhibition in its entirety, it must be admitted, we think, that it is highly creditable to those who have contributed to it. Still there are unmistakable signs, in the absence of specimens from the workshops of certain celebrated horologists, of the apathy which has operated so prejudicially for the interests generally of the professors of horology in England. There is no country in the world where the value of time, and the absolute necessity of punctuality in all engagements, are so fully appreciated as they are in the United Kingdom. So also is there, as has been above stated, no other country where so much practical and mechanical talent exists; why, then, should we not attain to the same amount of superiority in horology which has been reached in other branches of industry? The Conservatory of Arts and Sciences in Paris has one portion of it devoted to the illustration of French horological art, and assuredly it is not one of the least interesting features of it. We trust that when another assemblage of the fruits and flowers of the world's industry shall be consummated in our own vast conservatory at South Kensington, some riper and richer, as well as more numerous, examples of those fruits and flowers may be found in the horological section of it than are now visible therein. The great majority of exhibitors now are manufacturers established in London. Hereafter we shall be glad to congratulate some of our provincial friends upon their triumphs.

THE WHITWORTH AND HORSFALL EXPERIMENTS AT SHOEBURYNESS.

A detailed and accurate account from our special reporter of the experiments which took place at Shoeburyness on Thursday, the 25th September, reached us too late for insertion in our last number. Of these important and interesting trials of guns and projectiles, the proceedings and the results are in the main correctly reported in the *Times*. We do not, therefore, print our report *in extenso*, but we will correct the inaccuracies and supply the omissions of the *Times* report, which evidently was written with a strong *pro*-Armstrong and *anti*-Horsfall bias. In these nationally-important and costly experiments let us have the truth. Government most unwisely suppressed the report of the Iron Plate Committee, and thus withholds from the public a mass of valuable information which might assist inventors in improving our national defences. In addition to the usual assemblage of military and naval officers, Government officials, engineers, ship-builders, iron and gun manufacturers, there was on the ground a great number of foreigners, including agents of the French, Spanish, Prussian, and Danish Governments. It is, then, a farce on the part of Government to refuse to publish official reports of ordnance experiments on the plea of secresy, and it becomes the duty of the independent press to give a correct account of the results obtained. In the columns of that great authority, *The Times*, it would be in vain to look for a truthful description of Ordnance or Admiralty experiments. The reporter of that journal is the exponent of the views and wishes of the departments which give him access to those sources of information from which its pretentious, and not always veracious military and naval intelligence is concocted. The subserviency to official policy, and the spirit of partizanship which characterize those reports as a rule, were never more strongly exemplified than on this occasion.

The 120-pounder Whitworth gun, which at 600 yards, and with charges of 23 and 25 pounds of powder, produced destructive effects, which the 150-pounder Armstrong with a charge of 50-pounds could not equal, is coolly described by our contemporary in terms which would lead the public to suppose that it is an Armstrong gun, simply with the addition of Whitworth's hexagonal rifling. By this artifice of language, a great part of the extraordinary merit of the gun is claimed for Sir William. But, in point of fact there is no adaptation of his system in the construction of this now famous piece of ordance, except the partial application of the coil principle, which is not Sir William's invention, and which Mr. Whitworth is so far from adopting that, as it is well known, the very basis and essential principle of his mode of constructing guns is *homogeneous* iron, in the manufacture of which he has introduced further improvements, rendering it a far more suitable and economical material for guns than the so-called Armstrong coil. In the formation of the breach and other essential parts the construction differs entirely from the Armstrong plan, so that it is too bad to rob a successful and triumphant inventor of any part of his merit in order to bolster up the reputation of an amateur artillerist, who has signally failed in his attempts to produce a serviceable naval gun, although backed by the enormous resources and influence of the British Government. It would be amusing, if the results were not so costly to the nation, to contrast the language of the *Times'* reporter, inspired by official authority, in describing the Armstrong gun and projectile at two different periods. In the autumn of last and the early spring of this year, the country was congratulated on the possession of the most formidable ordnance in the world, in the form of the Armstrong Gun, whose destructive effects no armour plate, it was said, could resist, and now it is admitted that to penetrate an iron ship "The Armstrong is out of the question." In this way, by boasting paragraphs in newspapers, echoed and confirmed by bland secretaries, parliament and the people are mystified and deceived.

Nothing can be more unfair or untrue than the description given in the *Times* of the results of the practice with the Horsfall gun. For the purpose of enabling our readers to perceive the gross partiality and misrepresentation of the report in that journal, we copy the short notice with which the Mersey Monster is summarily disposed of, as being too contemptible for further observation, and shall contrast it with our own reporter's account, for the accuracy of which we appeal to the numerous spectators present at the experiments, to the artillery officers and men who laid and fired the gun, and to the evidence of the target itself, as it still stands at Shoeburyness:—"The "trials were continued with the Horsfall gun "at 800 yards against the uninjured plates of "the same target. The immense difference "between the powers of a smooth-bore and a "rifled gun, both as to accuracy and force of "its projectile, then at once became apparent. "The first shot was fired from the Horsfall "with 74 lbs. of powder, and a 275-lb. round "shot struck in front at some 10 or 12 feet to "the left of the target, which it missed alto- "gether. The gun was *re-laid again;* the shot "struck the ground about 40 feet in front of "the mark, ricochetting with a slight rise, and "striking full on an uninjured plate. In this "case it smashed an immense hole, shattered "the teak, and fractured the inner skin, leav- "ing all the elements of a fearful leak, as Mr,

"Whitworth's first shot had done, but, like "that also, not going quite through. The "third shot again missed the target entirely, "striking wide of the mark, and the fourth "and last only just saved the now sadly-dimi-"nished reputation of the gun, by hitting the "extreme uppermost corner of the target, the "metal of which it smashed. The failure of "this gun at this range was, therefore, as satis-"factorily settled as the success of Mr. Whit-"worth's, and the trials were discontinued."

That is the report of the *Times*. The following is extracted from our own :—

The important feature of the day's experiments was the trial of heavy ordnance at long range against the section of an armour-plated iron ship. For the purpose of instituting a fair comparison with experiments at short range, the target was precisely similar to the "Warrior" section, which had been so frequently fired at with Armstrong and 68-pounder guns at 200 yards, but it was of smaller dimensions, being 12 feet long and 10 feet high, without a port, whilst the original 'Warrior' target was of the same height, and 20 feet in length, with a port in the centre. The guns employed for the attack were the celebrated Horsfall 280-pounder, smooth bore, carrying a 13 inch round cast iron shot, with a charge of 75 lbs., and the Whitworth 120-pounder rifled naval gun, carrying a 6-inch flat-headed cylinder, with hexagonal rifling, 13½ inches in length, as a solid shot, and 17 inches in length as a shell, with a charge of 23 lbs. for the former, and 25 lbs. for the latter, the weight of the projectile being 131 lbs. in both cases. The Whitworth gun was trained at 600 yards, the Horsfall at 800 yards. In estimating the effect and accuracy of the firing, the length of range must be kept in view. In former experiments with Armstrongs and 68-pounders the range was only 200 yards. On every occasion of short-range trial they were favoured with fine clear weather, but this day's proceedings were inaugurated with a dense fog, which for some time made it doubtful whether the experiments could be carried out at all, and during the whole day the weather was so hazy that at 800 yards the target was barely visible. This state of the atmosphere materially affected the aim of the Mersey gun, which was 200 yards more distant from the target than the Whitworth. The former was under another serious disadvantage in being badly sighted, whilst the sighting of the Whitworth is so perfect a mechanical contrivance that a miss is almost impossible. These circumstances are to be taken into account in comparing the accuracy of the practice with the two guns. Before commencing the experiments a pioneer shot was fired from each gun to obtain the elevation, and did not hit the target. By means of a frame a few feet in front of the target, with fine copper wire stretched across it horizontally, the striking velocity of the projectiles was ascertained with great accuracy.

The target is covered with three 4½-inch plates, each 3 ft. 4 in. wide, and about 12 ft. long, backed with 18 in. of teak secured to the skin and frames of an iron ship.

The Whitworth solid bolt hit the middle plate fair about 3 ft. from the left butt, penetrated the 4½-inch plate and half the thickness of the wood backing, in which it buried itself, being spent before it reached the iron skin plate, but the projectile force transmitted through the wood burst open the skin plate, and broke two iron frames, making a ragged fracture 12 to 15 in. square. The hole in the armour plate, 8 in. in diameter, was perfectly round, and clean cut as if drilled with a tool. This effect is to be attributed to the rapid rotary motion of the rifled projectile combined with its onward velocity, which, at the moment of impact, was 1,284 ft. in a second.

The Whitworth shell struck the same plate at the right hand corner 12 to 15 in. from the butt and the bottom joint. It penetrated like the solid shot through the armour plate, and exploded in the teak backing. The force of the explosion burst through the skin, producing an aperture 9 in. in diameter, and broke the outer frame, but no splinters passed through the target. The impact being close to the outer edge, the explosive force expended itself chiefly in blowing out sideways the timber backing, which protruded 8 or 9 in. from the end of the target. The cover of the shell passed out through the wood in that direction, and was pitched up 20 or 30 yards to the right. The hole in the plate was rather larger, and not so perfectly round or smooth as that produced by the solid shot, and the plate was cracked in three places around the hole.

After the trial shot to regulate the range, the first discharge from the Mersey gun hit the target on the right, at the joint of the middle and bottom plates, making a terrific jagged fracture through both plates measuring more than 2 ft. in diameter, but like the Whitworth bolts it failed to penetrate the target, and lodged itself in broken fragments in the teak backing. The transmitted force burst open the skin plate over a surface three or four times larger than the fracture caused by the Whitworth projectile, and completely smashed a frame into pieces. This shot grazed the ground a few feet before the target and passed under the wires, so that its velocity was not ascertained, but as the striking velocity of another shot was afterwards obtained, it is as well to mention here that it was 1,285 ft., with the remark that no doubt the destructive effects of the first shot would have been much greater if by ricochetting it had not lost part of its projectile force. The next shot was a miss, which the officer who pointed the gun accounted for by what he termed the "miserable mode of sighting," which in the hazy state of the atmosphere made a good aim impossible. The third shot hit the upper left corner of the top plate and smashed great pieces out of it, leaving a fracture 3 ft. long and 2 ft. wide. Owing to the want of sufficient support at the back close to the edges, no inference can be drawn from this result, which indicate the correctness of what has been frequently shown in target trials, that the effects depend a great deal on the nature of the backing.

The day was now so far advanced that the experiments were brought to a close, but as the steely texture of the broken iron of the plates exhibited symptoms of inferior quality, a 68-pounder was fired at one of the plates at 200 yards, and with the same service charge which was the standard test of quality at former experiments. The result was an indentation in the 4½ in. plate of 4·05 in., together with extensive disintegration of the iron in a ring of cracks round the edges. Compared with similar trials on the Warrior and Iron Plate Committee targets, which gave a maximum indentation of 3·5, and an average under three inches, these results prove the iron of the plates on this occasion to be much inferior in quality. They were stated to be remanents of the "Black Prince," constructed by Messrs. Napier & Co., of Glasgow, and bear the mark of Messrs. Rigby, of Parkgate Works, near that city. It is to be hoped that the armour plates of the "Black Prince" are superior in quality to the specimens experimented upon.

THE MANUFACTURE OF GUNPOWDER.*

(Concluded from page 191.)

On the "Cost of Powder" we are told "secondary, and only secondary, to the quality of "powder is the cost. Good powder, made "with a small outlay, is the point required "from the agent by the Government; but "much of the cost depends on the price of the "crude materials. The cost of the nitre alone "is one-half the expense of the powder. The "English service powders cost £5 upwards for "the 100 lbs. The best sporting powders sell "in London for from £10 to £15 the 100 lbs. "Blasting powder is sold by dealers from "50s. to 75s. per 100 lbs."

Treating of the motive power, we are informed that "every description has been em-"ployed in the mills." Running water is considered the best, and steam the worst, owing to the danger necessarily attending this manufacture. In India bullocks are employed.

The powder being finished is submitted to the hygrometric proof, to test its power of absorption, as upon this depends its loss of strength by storage, especially in humid climates or situations.

"If the powder did not continue of one uni-"form strength, or in some known ratio of a "conserved standard, all the science, expe-"rience, and practice of the artillery would be "useless. A standard of strength must be "established, and some mode settled as to "measuring it. The present authorized mode "in India is a Gomer mortar of 8 in. diameter, "8 cwt. 1 qr. in weight, 1 ft. 4, 3-10th in. in "length of bore. The shot, a ball of solid "iron of 68 lbs. weight, 7·85 in. in diameter, "charge of powder 2 oz., elevation 45°, proof "distance for the shot to be thrown 63 yards; "if below this range the powder is rejected. "A decrease of half a tenth of an inch in the "diameter of the ball, or in increase of the "same quantity in the diameter in the mortar, "will render both unserviceable for proof, as "will also an enlargement of the vent of half "a tenth of an inch." This is the first proof. Then at the close of the practice season, some of the powder of the previous year is taken indiscriminately and tried with every available piece of ordnance. This is the Commandant of artillery's proof. There is a third severe test carried on in each of the Presidencies with powder from all these. There are the hot and wet weather proofs in which the powder is subjected to a variety of experiments, and all the results are carefully tabulated. From a mass of most important information we extract the following :—

"*To analyze powder.* To 100 grains add 600 "grains more or less of distilled water, then "filter the solution through clean filtering "paper. The water is then to be evaporated "over a spirit lamp, the dried residue will be "the proportion of the saltpetre. The mass "collected on the filtering paper consists of "the sulphur and charcoal combined. If this "residue be placed in a copper dish, and "heated to above 240 degs., the sulphur will "disengage itself in fumes, and leave the char-"coal. If the saltpetre of any quantity of "gunpowder to be examined be not pure, by "dropping a few drops of the solution of "nitrate of silver into the clear solution that "has drained through the paper filter, any "impurity of chloride of salts will be indicated "by the clear solution becoming cloudy; the "proportion of impurity may be detected by "chemical tests."

"The experiments on Mortars" is a chapter of great importance, and the tables and mathematical illustrations on experiments, with charges at various ranges—the effects of reducing the weight of ball—windage and recoil, will well repay all interested in artillery pratice, or knowledge, for careful study, as will also the succeeding chapter on musketry experiments. The *Appendix*, which occupies one-third of the volume, contains much varied information on the subject of gunpowder, among the matter of which it treats are "experiments "on varied proportions of ingredients of gun-"powder;" "chemical effects of combustion in "close chambers;" gun cotton, and other sub-

* Sketch of the Mode of Manufacturing Gunpowder at the Ishapore Mills, in Bengal, with a Record of the Experiments carried on to ascertain the value of charge, windage, vent and weight, &c., in mortars and muskets; also Reports on the various Proofs of Powder, by Colonel William Anderson, C.B., late Agent at Ishapore, with Notes and Additions by Lieutenant-Colonel Parlby, Retired Bengal Artillery. Weale. London: 1862.

"stitutes for gunpowder; "accidents;" "modern improvements in artillery;" the "manufacture of war rockets, &c."

The chapter on modern improvements in artillery, &c., possesses peculiar interest at the present time, and is the production of the editor. It deserves to be extensively read and studied. Its author takes a retrospect of these improvements, and justly observes, "that as an entire change has been effected, or "is now taking place, in almost every department of the science of war, those nations "that are neglectful, or remain unprepared in "this advance—if unfortunately they become "involved in hostilities—must suffer the "evil consequences of such neglect. Those "who depend upon the traction of horses for "conveyance, cannot attempt to compete "with the railroad speed of the present day; "neither can the less powerful cannon and "fire-arms of comparatively recent date be "now brought into the field with any chance "of success; and, moreover, *the stream of "advance and improvement is yet moving on!*

"In naval and land battles, therefore, as "well as in our system of fortification, great "changes must necessarily take place, and it "requires no argument to prove that, to be "effective against iron-plated ships, we must "have more powerful ordnance, and probably "abandon the old plan of placing guns on "ramparts to fire through embrasures, by "which defective plan ships can run up close "to the batteries, exposed to the fire of only a "fraction of the number of guns planted upon "them. The ramparts should be plain, and "the cannon defended by moving cupolas, or "shields, with proper traverses between each "gun, to prevent the effects of enfilade, and to "protect the unemployed gunners and those "that serve the ammunition, and only high "enough for those purposes. Thus the guns "will be '*en barbette;*' and by having no "limitation as to their lateral range, can bring "the whole force of the artillery into play on "any front attacked by land or sea."

There are now at least four serious questions, the subjects of controversy and experiment, relating to artillery and fire-arms:—

1. Whether cannon should be of solid metal, cast or otherwise; or whether they should be built up, or a combination of several parts?
2. Whether to be rifled or smooth bore?
3. Whether they should be muzzle or breech-loading?
4. The best form of projectile.

These *vexatæ questiones* are ably discussed, and cannot fail to impart great additional value to this elaborate and important work. The work is in large octavo, and contains 303 pages of large type. The paper and printing are excellent, and the appearance of the volume very attractive, which are great desiderata too often overlooked in scientific treatises.

We are sure the book will be carefully studied in foreign countries by all interested in the science of war. This has been anticipated by the gallant editor, who has printed on the fly-leaf a list of no fewer than thirty-eight cities, in foreign countries and the colonies, where the volume can be obtained. We commend the book to the serious consideration of our own countrymen, assuring them that it is, in our judgment, on the subjects of which it treats, *the* book for the times.

THE WRECK REGISTER AND CHART FOR 1861.

(With the Chart.)

SHAKESPEARE compares England to a fortress, and the channel to a moat; but if he saw the leviathan steamers now coming up that channel, he would be the first to acknowledge that the comparison did not hold good in the present day. We do not now look upon the sea as itself giving us a defence; it is only our chief medium of defence. But it is now, as in the days of Drake, our great commercial highway and source of our strength, girdling us, if it do not guard us, and bearing into our havens all the products of the known globe. All who leave us or approach us must do so by this great highway, which carries on its bosom in the course of one year alone, to and from our own ports, no less than 267,770 ships, including repeated voyages, and which ships have probably been manned by 1,600,000 souls.

Such is the field of operations over which these dry statistics of the Board of Trade carry us. As usual, they have been most ably drawn up and collated in every possible form. Yet on nearly every page of this Register these startling facts, in admonitory terms, face us, that 1,494 shipwrecks occurred on British shores last year, from which 884 people are known to have perished.

The number of wrecks last year has unfortunately exceeded the number during any of the preceding nine years, and it is 260 in excess of the annual average of the last six years.

It is a lamentable fact that shipwrecks on our coasts have been of late years on the increase. Thus, during the last seven years, we find the following account:—In 1855, 1,141; 1856, 1,153; 1857, 1,143; 1858, 1,170; 1859, 1,416; 1860, 1,379; 1861, 1,494!

The accompanying Wreck Chart clearly shows the spot where each casualty occurred, and the number of lives lost by it.

We are told that this great increase of disasters in 1861 was owing to the fearful gales of January, February, and November of that year, when 842 wrecks took place, principally amongst our rotten collier class of vessels. Gales, even of a moderate character, are always destructive to these ships; or, in other words, they are doomed to certain destruction under circumstances in which a ship, if seaworthy, and properly manned and found, ought to be able to keep the sea. The best harbours of refuge in the world would not, therefore, prevent a tithe of these disasters, which unfortunately too often occur where neither the lifeboat nor the rocket apparatus is available to succour their unfortunate crews.

We regret to find that the number of collisions is also on the increase. No calamity is more fearful than that of a collision at sea during a dark, stormy night. Its destructive effects are instantaneous, and frequently a large number of persons go down with either ship. The collisions in British waters were in 1859, 349; in 1860, 298; and in 1861, 323! But what is very remarkable in regard to these fearful collisions is the fact that, during the past six years, 750 collisions have taken place in clear and fine weather, 378 from bad look-out, 264 from neglect of rule of road at sea, and 61 from actual want of seamanship, the gross total of collisions during the past six years having been 1,864.

A natural sequence of the increase of vessels wrecked is the increase of precious lives lost. The number of persons who thus lost their lives in 1861 was, as previously stated, 884; while in 1860 it was only 536.

This, let it be remembered, is not a casual loss. It is a continual if not an ever-increasing one. The drain on our sailors and fishermen goes on year after year, notwithstanding all the benevolent and strenuous efforts made at the present day to stay the ravage. The sea is dreadfully exacting in its demands; and season after season, when the equinoctial gales blow, when the winter sets in, or when the summer, as our last one did, yields to the temporary but powerful influence of storms, our shores are converted into altars, on which the ocean offers his victims. It is unlikely that we shall ever effectually obtain the mastery over the waves; but, even at this moment, we are able to contend successfully with them in their blind efforts to swallow up life against our endeavours to save. If, for instance, during 1861, 884 people lost their lives on our coasts by shipwreck, yet no less than 4,624 were directly saved from such a fate. The whole number makes up a considerable fleet of seamen—men for whom, perhaps, in moments of national emergency, we would give any money—and many of these were preserved under the most perilous circumstances by the craft of the National Lifeboat Institution.

The total number of casualties in two years is 2,873, out of which 1,660, or about seven-twelfths of the whole, happened to ships of the collier class—a fearful disproportion, and calling loudly for a thorough and searching investigation.

The following table distinguishes clearly the description and tonnage of the ships lost during the past year:—

	Vessels.
Vessels under 50 Tons	228
50 and under 100 ,,	434
100 ,, 300 ,,	639
300 ,, 600 ,,	135
600 ,, 900 ,,	31
900 ,, 1,200 ,,	18
1,200 and upwards	5
Unknown	4
Total	1,494

Let us briefly analyze the causes of this great destruction of property. We find that 10 wrecks took place in a perfectly still sea, 14 in light airs, 51 in light breezes, 43 in gentle breezes, 103 in moderate breezes, 171 in fresh breezes, 149 in strong breezes, 66 in moderate gales, 124 in fresh gales, 230 in strong gales, 311 in whole gales, 102 in storms, 52 in hurricanes, and 68 in unknown and variable weather. Total wrecks 1,494. Of these 619 took place amongst ships in the home and coasting trade, commanded by men not required by law to have certificates of competency; 266 wrecks only occurred amongst vessels in the home trade, commanded by masters holding certificates of service; so that the rivalry between ignorance and knowledge is an unequal one, as it ever has been and ever will be.

The estimated loss on these 1,494 wrecks is upwards of one million sterling. But who can estimate the loss of the valuable lives who also thus perished with the ships! Many a widow and orphan in our seaport towns and fishing villages will tell us how severely they have felt their bereavement!

The accompanying roll of the loss of life on British shores and waters during the past twelve years will be perused with melancholy interest. The districts are thus classified:—

	Lives lost.
Farn Islands to Flamborough Head	670
Flamborough Head to the North Foreland	1,068
North Foreland to St. Catherine's Point	514
St. Catherine's Point to Start Point	82
Start Point to the Land's End	460
Land's End to Hartland Point, including Scilly	353
Hartland Point to St. David's Head	473
St. David's Head and Carnsore Point to Lambay Island and Skerries, Anglesey	969
Skerries and Lambay to Fair Head and Mull of Cantire	1,597
Cape Wrath to Buchan Ness	257
Buchan Ness to Farn Islands	280
All other parts of the coast	922
Total lives lost	7,645

It is thus seen that the most serious wrecks, as was urged in parliament last session, do not happen on the north-east coast of England, but in those seas and channels mostly frequented by large foreign-going ships. This is a matter deserving earnest public attention. Some hundred thousands of pounds judiciously laid out in improving our great natural harbours of refuge, would, we think, be attended with the greatest possible benefit.

Again this fearful list tells us in legible terms that man cannot avert the storm, nor prevent the occurrence of wreck and violent death at sea. The proudest vessels that he builds of wood and iron are but as large straws before the winds of heaven. A breath can dash them on the shore, and they perish in their pride, and our vanity is

humbled. We may never hope to rise superior to every storm or cause of wreck. It is our duty, however, to strive for safety—to continue to wrestle hard with danger—to confine disaster and death within the narrowest limits which human efforts can impose upon them.

How happily, then, the efforts of the National Lifeboat Institution, the Board of Trade, and kindred bodies on the coast have been blessed during the past six years! During that period alone 16,119 persons have been saved from shipwrecks by means of the lifeboats, the life-preserving apparatus, shore-boats, and other appliances, as the annexed list shows:—

	Lives saved.
1856	2,243
1857	1,668
1858	1,555
1859	2,332
1860	3,697
1861	4,624
	16,119

He must be less than man who can read unmoved and without a glow of admiration the account of such services and of those given in that Institution's report. Take the rescue of the crew of the brig "Sisters," of Whitby, on the 26th February last. It will serve as a suitable illustration of the dangers that have to be encountered by the skill, courage, and endurance that are needed of the brave fellows who man the society's life-saving fleet:—

"The 'Sisters' was laden with coals, and had been driven on shore on the South Barber Sand, off Caistor. Her signals of distress having been seen from the beach, the Caistor boatmen proceeded to launch the lifeboat there through a tremendous surf, the wind blowing a heavy gale from the east at the time, and the night being intensely dark. Under these difficult circumstances, although more than 100 persons were engaged in helping to launch the boat, an hour elapsed before she could be got off the beach and warped to the hauling-off anchor laid down outside the surf. Sail being then made on her, she worked to windward to the scene of the wreck, where the anchor being let go, she was veered down, but owing to the darkness and the fearful sea breaking over the vessel, it then took an hour to get the crew of nine men into the boat, and that at very great risk, as the lifeboat was often lifted by the sea high above the vessel's sides, and several times dashed violently against her and on the sand, thereby incurring considerable damage; also losing one hundred fathoms of her rope gear, which had to be cut away on hauling off from the wreck. It was indeed life for life, but humanity prevailed in the courageous encounter, and the wrecked crew were ultimately got safely in, and landed through a heavy surf. Forty-five pounds were paid by the Institution for this service, viz., £40 to the 20 men forming the lifeboat's crew, and £5 to the parties assisting to launch the lifeboat."

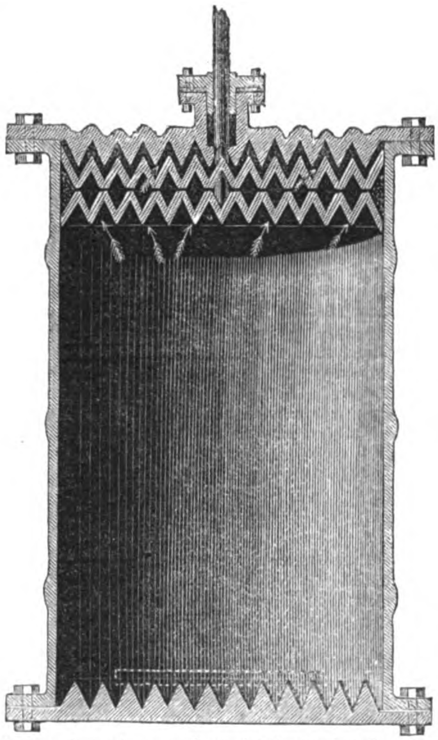
Englishmen in every part of the world may surely pause with pride over such chronicles of lifeboat services on our coast, as also over the reports of the cheerful liberality with which the National Lifeboat Institution is supported, to enable it to continue and extend with unabated vigour its merciful operations on our coasts.

We will recapitulate some of these beneficient gifts, and allude to the Society's operations.

Lord Chief Justice Erle, and the Corporation of London, and the Members of the Royal Thames and the Victoria Yacht Clubs, contributed liberally for the safety of the seamen. A citizen of Newcastle-on-Tyne, to whom a legacy of £19 had been left, passed it over, not to his own banker, but to that of the Institution. "N.L.," residing in Manchester, sent £250 to defray the cost of the Kirkcudbright lifeboat; and a stranger, "who would not give his name," left at the institution a bank note for £200. Mrs. E. Hope, carrying out the dying wishes of her husband, the Rev. F. W. Hope, gives £340 to buy a new lifeboat for Appledore, Devon. The ladies of Newbiggin realized for the funds £301 16s. by a bazaar; Mrs. Hartley and Miss Bertie Cator, promoting lifeboat funds, were enabled to raise six hundred guineas; Miss Burdett Coutts, in her exhaustless beneficence, gave the cost of the Plymouth and Silloth lifeboats; Mr. G. J. Fenwick, of Seaton Burn, contributed £250 to provide the Tynemouth lifeboat. Miss Brightwell, honouring her father, pays the cost of the Blakeney boat, and calls it after his name; and certain travellers in the smoking saloon of the North Kent Railway, bethinking them of the claims of the National Lifeboat Institution, extemporised a subscription to increase its resources. Even from Abo, in Finland, £50 is sent to the Institution in admiration of its services to the shipwrecked crews of all nations.

We have a list before us of the names of upwards of one hundred wrecks, from which, within the space of two years and a half, 726 lives were saved by the lifeboats of the Society. It is on this list—this trophy of success—that the committee of this Institution found their latest appeal. During that period its establishments on the coasts of the United Kingdom have cost £27,260. They have voted £2,458 as rewards to the crews of their life-boats, and £572 to those who, by shore-boats and other means, saved 562 shipwrecked persons, in addition to the above 726; making a total of 1,288 persons saved from a watery grave during the last two years and a half. Since its formation, the Institution has been instrumental, by its lifeboats and other means, in saving 12,680 lives; and having now 123 lifeboats under its management, it requires a large annual income to meet the demands upon its priceless services.

SYMONS' CYLINDER-COVERS AND ENDS.



A very ingenious and useful invention has just been patented by Mr. N. Symons, of Cambridge-street, N.W., which consists in serrating or corrugating the upper and lower surfaces of pistons commonly used in steam engines, for the purpose of increasing the superficial area without increasing the diameter of the cylinder. The above engraving illustrates a cylinder of the ordinary construction having the piston formed according to the above invention. The arrows indicate the action of the steam against the serrations. The cylinder-cover and end are correspondingly shaped, to enable the piston to complete the full stroke. According to the patent, every form of corrugations, indentations, or grooves is protected. The invention is equally applicable to valves and cylinders of other than steam-engines.

THE ASSOCIATION FOR THE PREVENTION OF STEAM BOILER EXPLOSIONS.

Chief Engineer's Monthly Report.

At the last ordinary Monthly Meeting of the Executive Committee of this association, held at the offices, 41, Corporation-street, Manchester, on Tuesday, September 30, 1862, Hugh Mason, Esq., vice-president, in the chair, Mr. L. E. Fletcher, chief engineer, presented his monthly report, of which the following is an abstract:—

"I am happy to be able again to report that no explosion has happened during the past month to any boiler under the inspection of this association, neither has the occurrence of any in other quarters come to my knowledge.

"During the past month there have been examined 263 engines and 451 boilers. Of the latter 15 have been examined specially, 6 internally, 72 thoroughly, and 358 externally; in addition to which 4 of these boilers have been tested by hydraulic pressure. The following defects have been found in the boilers examined:—Fracture, 8 (1 dangerous); corrosion, 49 (8 dangerous); safety-valves out of order, 3; water gauges ditto, 14; pressure gauges ditto, 4; feed apparatus ditto, 3; blow-off cocks ditto, 16 (1 dangerous); fusible plugs ditto, 5; deficiency of water, 1; blistered plates, 3 (1 dangerous). Total, 106 (11 dangerous). Boilers without glass water gauges, 5; without pressure gauges, 1; without blow-off cocks, 17; without back pressure valves, 25.

"Two boilers have recently been met with, neither of which was fitted with its own separate safety-valve, but both were dependent on a single one placed upon the steam pipe, the communication between which and each boiler was conditional on its junction valve being open, so that had the attendant at any time inadvertently left this valve screwed down—on getting up steam, for instance, on a change of boilers—the whole steam pressure must have been bottled up without chance of escape.

"Feed Back-Pressure Valves.

"Some of our members do not appear to be fully aware of the importance of fixing a feed back-pressure valve to each of their boilers, and therefore the following instance, lately met with, of the inconvenience arising from the want of them, may be given:—

"Four boilers, set side by side and connected together, were working under their ordinary circumstances, when one of them vomited its water through the feed pipe into the adjoining one, draining itself, and over-charging the other. The danger of this, if not immediately detected, with a fire in active operation, will at once be seen. It is, however, by no means an uncommon occurrence where back-pressure valves are omitted, especially where any thickening matter exists in the water, which tends to lift it and cause priming, under which circumstances the water has been found to rush backwards and forwards alternately between boilers working in connection. The back-pressure valve prevents this; the water from the feed pump operating underneath and raising it, while the pressure from the boiler operates on the top and closes it. Necessary as these valves are to the safety of boilers when working in a series, they should not be neglected in the case of those working singly, not only when fed by a pump, but also when fed direct from the waterworks main; in the first case, in order that the pump-valves may be accessible when steam is up, and in the second, that the reflux of hot water from the boiler may be prevented either on the bursting of the pipe or other cause. These valves should be placed immediately upon the shell of the boiler, and not at a distance from it, as is sometimes the case, since scalding might ensue should any joints break in the intervening length of pipe, while repair could not be effected without letting the pressure down. For the same reason the feed stop valve should not be interposed, which it too frequently is, between the back-pressure valve and the boiler, since a disarrangement of the stop valve may entail an entire stoppage, which had the feed back-pres-

sure valve been placed immediately upon the shell, could easily be rectified with steam up.

"In the construction of this valve care should be taken to limit its rise, for want of which simple precaution some of them have proved to be entirely useless, the water passing freely from one boiler to the other, as if the valve were not there. Its most convenient position is at the front end plate of the boiler, nearly on a level with the furnace crown. Its beat can then be heard at every stroke of the engine, and if a screwed spindle be added, so as to convert it into a combined feed stop an back-pressure valve, which is the best arrangement, then the feed can be regulated without leaving the furnaces.

"Blow-out Apparatus.

"A case of scalding has lately occurred in consequence of the failure of the blow-out apparatus of a boiler, which was, however, not under the inspection of this association.

"The manner in which blow-out taps are often strained with long levers in opening and closing, renders it a matter of surprise that fracture does not more frequently occur, and many have such inefficient arrangements for carrying off the waste water that it beats back with so much violence on the taps being opened that their use is quite dangerous. Enginemen are in this way but too frequently scalded severely, and our own inspectors sometimes meet with narrow escapes. Some taps are so inconveniently placed that the nut at the bottom of the plug is quite inaccessible, and thus becomes neglected, in consequence of which several cases have occurred of the plug being shot out by the force of the steam on being opened. Taps fitted with glands are safer as well as more convenient; they should, however, be made entirely of brass in the shell as well as in the plug, and be fitted with a suitable waste pipe. Those made of cast-iron in the shell, and brass in the plug are generally found to be inconvenient, and sometimes dangerous, on account of the unequal expansion of the two metals, from which it is frequently impossible to close them, when the boiler becomes robbed of its water, and the fires have to be drawn to prevent injury to the furnaces.

"The case in question, however, was somewhat peculiar, and the fracture did not arise from either of the above causes. The blow-out tap was attached to the boiler by a cast-iron elbow pipe, and this pipe broke short off without warning, while the boiler was at its regular work and the blow-out tap not being touched.

"The cause of this appeared to be as follows: —Boilers, as it has been previously stated in these reports, are too frequently considered to be in a state of rest when once set upon their brickwork bed; whereas, from the constant changes of temperature, and the consequent contraction and expansion that take place, not only in the boiler itself, but also in the brickwork, the whole is in a continual state of movement. It appears most probable that this action had in process of time induced a slight settlement of the boiler, and thus that a strain was brought upon the cast-iron elbow pipe, which being bound by the brickwork, consequently gave way. A torrent of hot water naturally ensued, which, unable to escape at the usual outlet, found its way into an adjoining building, where it partially flooded one of the floors, and two or three persons became scalded in consequence.

"Prevention of Incrustation.

"It may be stated in brief that the scum pipes for surface blowing out, which have been recommended from time to time for the prevention of incrustation in boilers, have now been adopted by several of the members, and have, for some time since, been in very successful operation. An early opportunity will shortly be taken of making more detailed reference to this subject; but, in the mean time, it may be stated that a drawing of the arrangement adopted lies at the office for the inspection of the members, and that full particulars, both of the details of construction and results of working, will be given on application.

"Hints to Members on Laying Down New Boilers.

"There is one branch of the service this association affords which the members do not avail themselves of as fully as they might—namely, that of consulting the records at the office before laying down new boilers or making alterations. Full particulars are kept, not only of the construction of the boilers under inspection, but also the results of their working; and a consultation of these would frequently save unnecessary outlay, prevent failures of one being repeated by others, and place at the command of each member the experience acquired by the inspection of the whole number of boilers under the charge of the association.

"L. E. FLETCHER,
"Chief Engineer."

AMERICAN INVENTIONS.

At a recent meeting of the Franklin Institute, Philadelphia, Mr. Howson, of the committee, on meetings, exhibited a military cap, the invention of W. F. Warburton, of that city. The edge of the cap is provided with a number of eye-lets or hooks, by which a detachable cap or havelock may be attached. A loose fold, forming a part of the cloth or covering of the cap, is arranged so as to conceal the hooks and eyes, the fold being retained in its position over them by elastic loops attached to the corners, and passing around the strap buttons.

Mr. Howson also exhibited an exceedingly well executed pair of bronzes, manufactured by Messrs. Warner, Miskey, and Merrill, of Philadelphia. The designs are copies, but the composition of the metal and the casting are the work of the above-named firm, who were the first in this country to manufacture heavy bronze work, one of their finest pieces being the bronze balustrade for the capitol at Washington.

Mr. H. also exhibited a musket, which, he remarked, was to all appearances similar to the many weapons of this class we every day see in the hands of our soldiers. The specimen, however, would be looked upon with unusual interest when they were informed that it was one of the first complete regulation muskets made in this city, and a specimen of the first one thousand muskets recently delivered to the Government by the manufacturers and contractors, the well-known firm of A. Jenks & Son, of Bridesburg. It had fallen to the lot of the exhibitor to examine minutely many modern fire-arms, both of American and European manufacture, and he could state that, as regards excellence of workmanship, neatness of finish, and superiority of material employed, the weapon could not be excelled.

Mr. Howson also stated that few could imagine, without investigating the subject of manufacturing fire-arms, the extent of the enterprise undertaken by the Messrs. Jenks. In order that some idea of the amount of labour and thought demanded in establishing a manufactory such as that of Messrs. Jenks, Mr. Howson produced a small pistol, known as Sharps' four-shooter, and stated that a witness had recently sworn that, to manufacture such a weapon profitably, an outlay of 100,000 dollars was necessary.

On comparing the two weapons, the members could form some judgment of the enormous amount of capital required and the ingenuity and forethought exercised by the Messrs. Jenks in perfecting, during little more than one year, the machinery and apparatus required to manufacture the weapon exhibited, at a price remunerative to themselves, and with the rapidity which the present emergencies of the Government demanded.

PATERSON'S IMPROVEMENTS IN RE-BURNING ANIMAL CHARCOAL.

These improvements, patented by Mr. Paterson, of the Middle Temple, relate to means or apparatus for re-burning animal charcoal. For this purpose the retorts, which are of a cylindrical form, may either revolve continuously in one direction, or partly in one direction, and then in the other; and instead of being placed with their axes in a horizontal direction, they are inclined, and they receive the charcoal to be re-burned at their higher ends through suitable channels; and then by the revolution of such retorts the contained matter will progressively traverse to the lower ends thereof, where there are vanes or cups, or other suitable means adapted to take up such matter, and discharge it into a receiver projecting inwards from such lower ends, and having a communication with the cooling apparatus.

Series of such retorts can be arranged to work together, each being caused to revolve, and being inclined from the feeding to the delivery end as stated, with the delivery end of the first discharging by a suitable way into the feeding end of the next, and so on with the succeeding retorts of the series.

The feed and discharge pipes are connected to the respective ends of the retorts in manner to admit of the retorts revolving. The charcoal from each retort, or from the last of a series of them, is conducted into suitable coolers before exposure to the atmosphere, and a jet or jets of water are employed to operate upon the external surfaces of the cooling chambers, or the passage or passages to them, to facilitate the cooling process. The means for lifting at the ends of the retorts may be separate, and operated by mechanical means.

The gas or vapour generated during the process is allowed to flow back and escape by the feed pipe, so as to avoid re-admixture with the manufactured or re-burned charcoal.

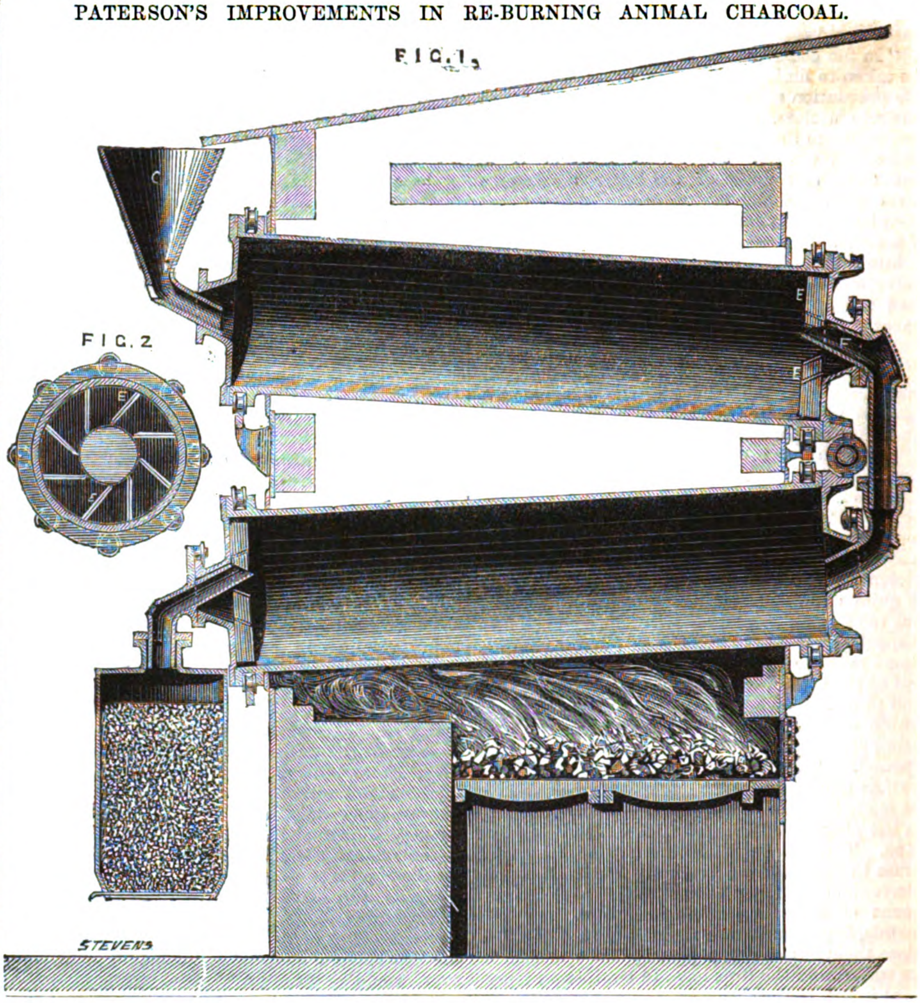
Fig. 1 of the above engravings shows a longitudinal section, and Fig. 2 a transverse sectional view of one set of retorts.

Two retorts are shown in a setting heated from the one fire-place as shown, but the number of retorts in the setting may be varied. It will be seen that each retort is set in a direction inclining from the feed to the discharge end. The upper surface or top plate of the kiln is formed by preference of cast iron, adapted to receive and support the charcoal to be operated upon; C is a hopper, in position to be readily supplied with charcoal from the top surface. This hopper is provided with a valve through which it discharges its contents into the pipe, and thence into the upper cylinder. The valve regulating the discharge from the hopper may be operated by a rod passing horizontally along the front of the kilns, and have a reciprocating motion given to it. The charcoal received by the passage G into the upper retort is, by the rotation of that retort, aided by its inclined position, progressively carried forward to the lower end thereof, when by coming on to the projections or vanes E E, it is by them lifted up and discharged into the mouth of the pipe F. Each of them is applied at an angle to a radial line, and the upper surface is inclined towards the head of the cylinder, but it may be curved or provided with sides to facilitate the taking up of the charcoal and its discharge into the pipe, and thence by another pipe to the upper end of the lower retort. The feed pipes may be sufficiently long to discharge the charcoal into the interior of the cylinders. The charcoal received into the lower cylinder is, in the revolution of that cylinder, aided by its inclined direction, carried forward to the lower end thereof, and then such charcoal is lifted by vanes or projections, similar to those above described, and discharged through a pipe G. These pipes are fitted with expansion joints. They may, if desired, be covered with a non-conducting material to retain heat, or they may be cast double for the same purpose. They are kept in contact with the mouths of the cylinders by connections on the flanges. The cylinders are supported on grooved friction rollers, on which they revolve. The re-burned charcoal from the lower retort is received in a chamber cooler, as shown. To the exterior of the chamber is applied water, in fine streams or jets, to hasten the cooling and permit their being made of thicker and more durable materials than usual. Hand and peep-holes are provided at various points, from which the operation may be examined and repairs

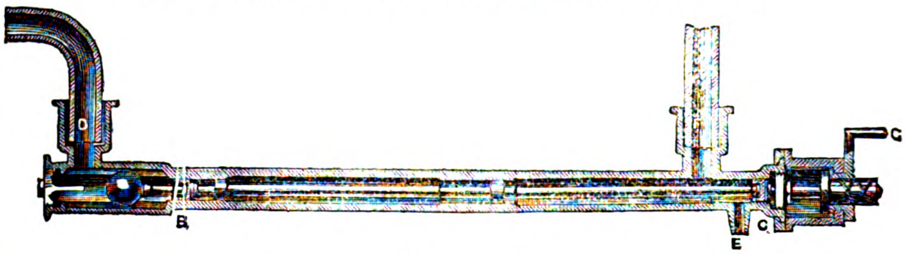
executed. P is a shaft driven by a steam engine or other power, and upon which is formed or affixed a screw, the thread of which takes into the teeth on the ends of the cylinders as the means preferred for giving rotary motion to them. This shaft P may continue along the front and work any number of sets of retorts or cylinders. These cylinders, as will be seen, are enclosed in brickwork, and have suitable flue spaces left for the conveyance of the heated gases from the fire below.

The operation of the apparatus is as follows:—The hopper is kept supplied with charcoal partially dried and heated on the top surface. By means of a valve the supply is regulated to the cylinder. The cylinder, by being inclined and kept in slow rotation, causes the charcoal to traverse its interior and heated surface till it reaches the projections or vanes E E; when entering between these vanes it is carried round till above the mouth of the pipe, when the angle the vanes assume causes it to drop into the mouth of the pipe, whence it is conducted, as stated, to the lower cylinder. The charcoal then, in like manner, traverses the second cylinder, and is discharged therefrom by its pipe into suitable coolers or thin vessels adapted to expose a large surface for cooling, and which are provided with valves or slides, by which the contents can be discharged thence at pleasure. The advantages of this combination and method of working are, that the charcoal gradually passed in a thin body over the heated interior of the retorts is more equally heated, and the gases which are eliminated by the operation are permitted a readier escape, whilst the operation generally is performed in a superior manner. By the continuous discharge into coolers before contact with the atmosphere the destruction of the carbonaceous matter is prevented. By the use of two or more cylinders, in connection with each other, and so arranged that the last, or that in which the operation is finished, receives the greatest heat of the fire, and the first, or that which receives the charcoal first in the series, the least heat, a considerable saving of fuel is effected.

PATERSON'S IMPROVEMENTS IN RE-BURNING ANIMAL CHARCOAL.



JONES' PATENT ANTI-FROST WATER PIPE PROTECTOR.



JONES' PATENT ANTI-FROST WATER PIPE PROTECTOR.

THE above engraving illustrates a very simple apparatus, which will be of the greatest possible utility, comfort, and economy to all householders and consumers of water, where supplied from street mains and other modes of supply; as it will effectually prevent that most annoying occurrence caused by stoppage from frost, and finding no water at the tap when required. The apparatus will ensure a supply in any weather when turned on, and save the expense of constant repairs after severe frosts.

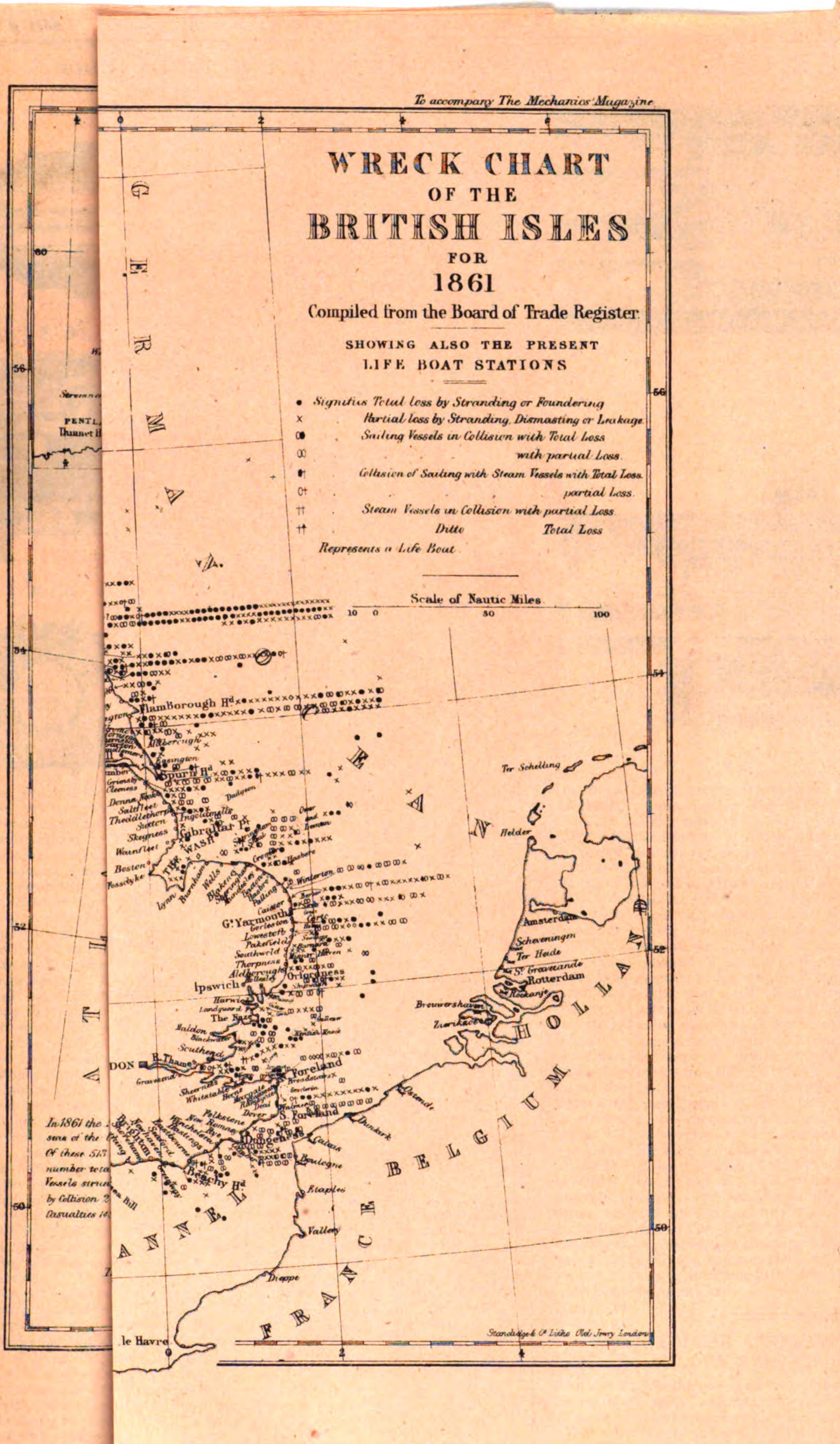
The patentees claim the following advantages which are to be derived from the use of the apparatus:—It prevents the stoppage of water by frost in supply pipes, and enables the water to be drawn when required with a certainty of supply. It prevents house mains and other supply pipes bursting by frost, and other consequent injuries and annoyances. The action is simple and certain, requiring no more trouble than in drawing water from an ordinary tap. It is applicable to any situation, and of service to Railway Companies in the saving of water, and insuring a supply to the locomotive tenders, without the application of a fire-grate to the hydrants, now in use throughout the winter months at all the stations in the kingdom. It is of service to Water Companies, in preventing waste of water from bursting of supply pipes to houses, and from allowing people to let the taps run, as the only existing means of keeping a supply of water in winter, and also from the use of plugs to draw water in the streets for the supply of the inhabitants of the frozen district; and likewise a saving of waste from leakage of taps, as these can be repaired without the necessity of giving notice to the company to turn the water off. It can, when the supply of water is constant and at a high pressure, be made self-acting. It is economical as a first cost in building, and, compared with the annual expense of repairs, and the vexations and hindrances to domestic comfort, and injury to property, it is a desideratum that no house should be without.

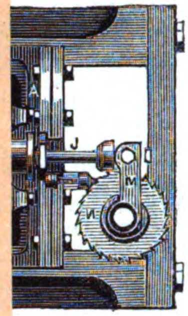
The apparatus is so arranged, that a supply of water can be obtained at any time by forcing the rod A towards the back end of the tube. This tube contains two valves, B and C, fixed on the rod A. The motion is effected by simply moving the lever G from left to right; this forces the valve B back into the larger chamber at end of tube, which then admits the water from the inlet-pipe D into the tube. The valve C closes the waste-pipe E, by taking a position (at the time the valve B is forced back) between the waste-pipe E and the rising main F.

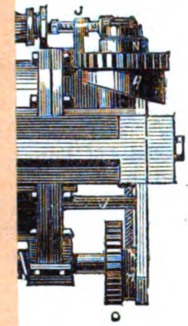
The water being then admitted into the tube, passes freely through the rising main F; and this position is maintained while the supply is secured, and no danger of the water freezing need be apprehended when it is being forced with great velocity through the pipes. When the supply is sufficient, the rod A has to be drawn back into its first position, which is simply done by moving the lever G from right to left, and the valve B enters the small part of tube, and shuts off the supply from the pipe D; and the valve C passing to the opposite side of the waste-pipe E, allows all the water in the tube and rising main to pass through the waste-pipe E; thus no water is allowed to stand in those pipes which are exposed to the action of the frost, consequently they can never be frozen up, and all danger of the pipes bursting is avoided, and a constant supply is at all times available when the apparatus is used. We understand the sole licence to manufacture the above apparatus has been obtained by Messrs. Bury and Pollard, Park Iron Works, Southwark.

CREASE'S INVENTION FOR DRILLING, BORING, OR EXCAVATING ROCK.

MR. E. S. CREASE, Mining Engineer of Gracechurch-street, has patented an invention for improved machinery for drilling, and boring rock and other hard substances, which perform as follows:—In perforating rock or other hard substance, instead of striking the boring tool or drill with a hammer. The inventor proposes to effect the same by means of a cylinder and piston, with a suitable hammer head attached to the piston rod to strike the head of the boring tool or other







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CREASE'S INVENTION FOR DRILLING, BORING, OR EXCAVATING ROCK.

FIG. 1

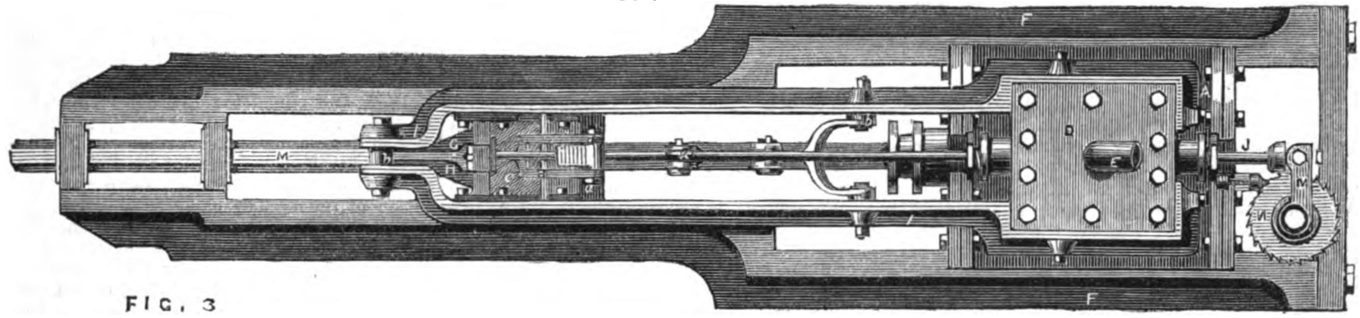


FIG. 3

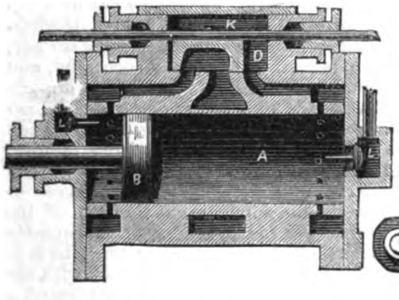


FIG. 2

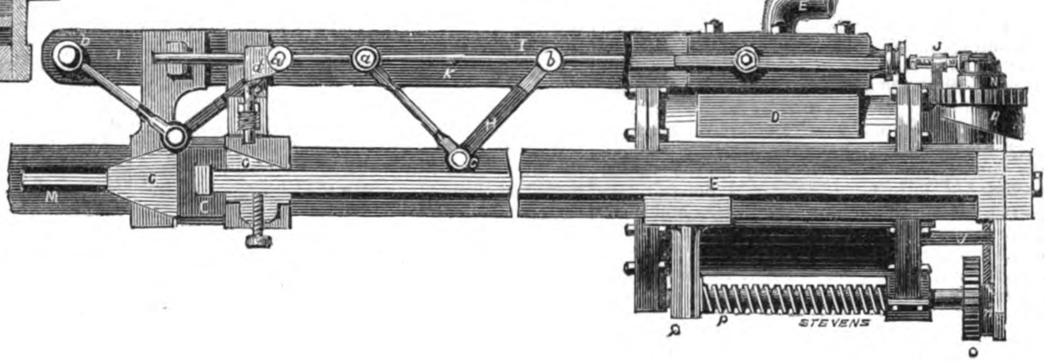
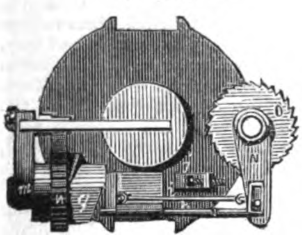


FIG. 4



instrument, which is held in suitable guides, the boring tool to be either connected with the hammer head, or affixed to it. Motion is given to the piston by steam or any other motive power through an arrangement of self-acting valves. He also gives a jumping rotative motion to the drill or other instrument by means of the hammer head if attached to it, or if not connected to it by means of tappets on the hammer head communicating the necessary motion through levers to a ratchet wheel on the head of the tool. He also applies a self-acting arrangement, by which the cylinder, piston, and hammer head are steadily advanced as the tool progresses in its work by the following means:—The slide valve rod which works the slide valve for admitting steam to the cylinder, he carries through the slide valve chest, and to the upper end of the rod he attaches a lever, which acts at every alternate motion of the valve rod upon a ratchet wheel mounted upon the top of the cylinder, which ratchet wheel has on its face a cam or shape, which transmits the motion, through another lever to a ratchet wheel attached to a screw, working in bearings at the top and bottom flange of the cylinder. The screw passes through a nut attached to the guides, in which the cylinder and hammer head are free to travel. The shape or cam on the first ratchet wheel is so constructed that motion is only transmitted to the screw at the completion of every half revolution of the boring tool. Upon the necessary motion being given to the screw, and so causing it to travel a certain distance through the nut, it of course carries the cylinder, piston, and hammer head a corresponding distance in the guides. The rate of progress is easily adjustable by means of a set screw, which is so applied as to increase or decrease at pleasure the travel of the lever, which acts upon the screw, and so of course increasing or decreasing the travel of the screw in a corresponding degree. The rate of progress will, of course, depend upon the substance which is being worked. He mounts the whole upon a frame so constructed that it can be worked either vertically, horizontally, or at any angle which may be required.

The engravings show the invention. Fig. 1 is a front elevation; Fig. 2 a side elevation, with a portion of the framing removed to show the valve gear; Fig. 3 is a section of the cylinder; and Fig. 4 is a plan of the top of the cylinder. A is the cylinder in which is a traversing piston B, to which is attached the hammer head C, which in this case is attached to the boring tool M, all supported by the side frames F, which form guides in which the whole is free to travel. E is the inlet pipe at which the steam is admitted into the slide valve chest D, from whence it passes into the cylinder, and acts alternately upon the piston B, after which it is exhausted.

In Fig 3 is shown two valves L L, one in each cylinder cover; in the event of the piston passing the inlet parts at either end it would open the valve, and thus admit sufficient steam to carry the piston past the ports on the return stroke, immediately upon which it would receive its full complement of steam from the slide valve chest. The steam pipes leading to the valves L L are to be connected with the feed pipe E. The pressure of the steam will of course keep the valves closed when not acted upon by the piston. On the end of the piston rod is fixed the hammer head C, which consists of a wheel with teeth cut in its periphery, slightly inclined from the perpendicular, to which is connected the boring tool M. Immediately above and below the hammer head C are fixed two shapes G G; the bottom one is of a conical form as it revolves with the wheel or hammer head C and the boring tool M. These shapes G G communicate the necessary alternate motion to the slide valve rod K by acting upon the levers H H, in the manner shown in the drawing; one end of the levers being attached to the slide valve rod, as shown at *a a*, the other end *b b* being connected to the side frames I I. Upon the shape G acting upon the levers at *c*, the distance between the points *a* and *b* is of course lengthened alternately, and so communicating the necessary motion to the slide valve rod K. On the rod K is fixed a shape *d*, which every time the rod is lifted forces out a stud *e*, which acting upon the toothed wheel *c*, causes it and the boring tool connected to it to revolve at every stroke the same distance that the teeth on the wheel or hammer head *c* are out of the perpendicular. On the stud *e* is a spiral spring *f*, which causes the stud *e* to return to its normal position upon the depression of the slide valverod K, and thus preventing it coming in contract with the wheel C during the down stroke of the piston rod. The upper end of the slide valve rod K, which passes right through the slide valve chest, as shown in section in Fig. 3, acts upon a ratchet wheel N (through the medium of the lever *m*), which ratchet wheel has upon its inner face a shape or cam *g*, which acts upon a lever *h*, to which is attached an india-rubber or spiral spring *i*, which at every complete revolution of the wheel N causes the lever *h* to return, and so by acting upon the ratchet wheel O (through the medium of the lever *n*) on the end of the screw P, passing through the nut Q, causes the cylinder, boring tool, &c., to advance in the guides F a distance corresponding to the distance traversed through the nut by the screw. The small set screws *j* are for the purpose of adjusting the rate of progress, by allowing the levers *m* and *n* to act upon one or more teeth of the ratchet wheels N and O, according to the description of the material being worked.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THE thirty-second annual meeting of this association commenced yesterday at Cambridge. Great preparations have been made by the University and municipal authorities to give *eclat* to the meeting and contribute to the comfort of members. The Senate-house and the halls of

various colleges have been liberally thrown open for the meetings of the sections. The corporation of the borough have placed the Guildhall at the disposal of the association for their general and evening meetings. The members of the British Association retain a grateful recollection of the success which attended their meeting in Cambridge in 1845; while the members of the University and the inhabitants of the town appear to be animated by a common desire to receive their distinguished scientific visitors with due hospitality and respect. The Fitzwilliam Museum, the Geological and Mineralogical Museums, the Observatory, the Museum of Comparative Anatomy, and the Botanic Garden are all thrown open daily during the meeting of the association.

The first general meeting was held at 8 o'clock p.m., in the Guildhall, which was crowded by ladies and gentlemen, among whom were—the the Earl of Enniskillen, Lord Wrottesley, the Vice-Chancellor of the University, Sir P. Egerton, Mr. Walpole, M.P., the Dean of Ely, Mr. Fairbairn, F.R.S., Mr. Tite, M.P., Mr. V. Harcourt, Mr. E. Chadwick, Rev. Dr. Whewell, Dr. Leapingwell, Professors Owen, Huxley, Phillips, Sedgwick, &c.

Mr. Fairbairn, F.R.S., the retiring president of the association, who was loudly cheered on presenting himself, said--"Ladies and gentlemen, it is my pleasing duty to introduce to you Professor Willis, the next chairman of the British Association. I need not refer to the services which Professor Willis has rendered to science; they are well known in Cambridge, and in the country, and appreciated by all the learned societies of Europe. (Cheers.) I congratulate you on his appointment to the chair, and I am quite sure it will do honour to the British Association. (Cheers.) Last year, at the meeting in Manchester, there were brought forward many subjects of great interest to science, which were most ably discussed, and I have no doubt the result of the meeting now taking place under the auspices of the learned Professors of Cambridge will be equally successful. It therefore gives me great pleasure to introduce to you my learned friend Professor Willis, and to resign the chair to that gentleman, who will now address you for the first time as President of the British Association. (Loud cheers.)

Professor Willis then took the chair, and delivered his inaugural address. After glancing at the early history of the association, he said:—"In considering the investigations carried out by committees or individual members, by the help of the funds of the association, it must always be remembered that their labours, their time and thoughts, are all given gratuitously. One of the most valuable gifts to science that has proceeded from our association is the series of its printed reports, now extending to 30 volumes; yet these must not be supposed to contain the complete record even of the labours undertaken at the request and expense of the body. Many of these have been printed in the volumes of other societies, or in a separate form. Several, unhappily, remain in manuscript, excluded from the public by the great expense of publication. I am the more induced to direct attention to this great work at present, because I hold in my hand the first printed sheets of a general index to the series from 1831 to 1860, by which the titles and authors of the innumerable memoirs upon every possible scientific subject, which are so profusely but promiscuously scattered through its 18,000 pages, are reduced to order, and reference to them rendered easy. This assistance is the more necessary because so many investigations have been continued with intermissions through so many years, and the labour of tracing any given one of them from its origin to its termination through a series of volumes is extremely perplexing. For this invaluable key to the recorded labours of the association we are indebted to Professor Phillips, and the prospect of its speedy publication may be hailed as a great subject of congratulation to every member of our body. In every annual volume there is a table of the sums which have been paid from the beginning, on account of grants for scientific purposes. The amount of these sums has now reached £20,000, and an analysis of the objects to which this expenditure is directed will show that if we divide this into eighteen parts it will appear, speaking roughly, that the section of mathematics and physics has received twelve of these parts—namely, two-thirds of the whole sum; the sections of geology and mechanical science two parts each, while one part has been given to the section of botany and zoology, and one divided among the sections of chymistry, geography, and statistics. The greater share assigned to the first section is sufficiently accounted for by the nature of the subjects included in it, which require innumerable and expensive instruments of research, observations, and expeditions to all parts of the globe. If we examine the principal subjects of expenditure, we find in the first place, that more than £1,800 was expended upon the three catalogues of stars—namely, the noble catalogue which bears the name of the British Association, commenced in 1857 and completed in eight years; and the star catalogue from the observations of Lelande and Lecaile, commenced in 1835 and 1838, and reduced at the expense of the British Association, but printed at the expense of Her Majesty's Government. £150 was applied principally to the determination of the constant of lunar nutation, under the direction of Dr. Robinson, in 1837, and to several other minor astronomical objects. At the very first meeting at York the perfection of tide tables, hourly meteorological observation, the temperature of the atmosphere at increasing heights, of springs at different depths, and observations on the intensity of terrestrial magnetism, were suggested as objects to which the nascent organization of the association might be directed. Its steady perseverance, increasing power and influence, as successive years rolled on, is marked by the gradual carrying out of these observations so as to embrace nearly the whole surface of the globe. Thus, under the direction of Dr. Whewell, a laborious system of observations, obtained by the influence and reduced at the expense of the association, who have aided this work with a sum of about £1,300, has determined the course of the tide wave in regard to the coasts of Europe, of the Atlantic, of the United States, of New Zealand, and of the east coast of Australia. Much additional information has been since collected by the Admiralty through various surveying expeditions, but it appears that much is still wanting to complete our knowledge of this subject, which can only be obtained by a vessel specially employed for the purpose. More than £2,000 has been allotted to meteorology and magnetism, for the construction of instruments, and the carrying out of a series of observations and surveys in connection with them. To this must be added a sum, between £5,000 and £6,000, for the maintenance of Kew Observatory, of which more anon. The advance made in these important sciences through the labours of committees of the British Association may be counted among the principal benefits it has conferred. To the British Association is due, and to the suggestion of General Sabine, the first survey ever made for the express purpose of determining the positions and values of the three isomagnetic lines corresponding to a particular epoch over the whole face of a country or state. This was the magnetic survey of the British Islands, executed in from 1834 to 1838, by a committee of its members, General Sabine, Professor Phillips, Sir J. Ross, Mr. Fox, and Mr. Lloyd, acting upon a suggestion brought before the Cambridge meeting in 1833. It was published partly in our volume for 1838, and partly in the *Philosophical Transactions* for 1849. This was followed by a recommendation from the association to Her Majesty's Government, for the equipment of a naval expedition to make a magnetic survey in the southern portions of the Atlantic and Pacific Oceans. This recommendation, concurred in by the Royal Society, gave rise to the voyage of Sir James Clark Ross in the years 1839 to 1843. In a similar manner was suggested and promoted the magnetic survey of the British possessions in North America, authorized by the Treasury in 1841; the completion of the magnetic survey of Sir James Ross, by Lieut. Moore and Lieut. Clerk in 1845, in a vessel hired by the Admiralty; the magnetic survey of the Indian seas by Capt. Elliot in 1849, at the expense of the Directors of the East India Company; and the magnetic survey of British India, commenced by Capt. Elliot in 1852, and completed between 1855 and 1858 by Messrs. Schlagintweit. Finally, in 1857, the British Association requested the same gentlemen who had made the survey of the British Islands in 1837 to repeat it, with a view to the investigation of the secular changes of the magnetic lines. This has been accomplished, and its results are printed in the new volume for 1861. The association also, aided by the Royal Society, effected the organization, in 1840, of the system of simultaneous magnetical and meteorological observations, established as well by our own Government as by the principal foreign Governments at different points of the earth's surface, which have proved so eminently successful, and have produced results fully equalling in importance and value, as real accessions to our knowledge, any anticipations that could have been formed at the commencement of the inquiry. General Sabine, whose labours have so largely contributed to these investigations, has given to the University an admirable exposition of the results during the present year, in the capacity of Sir Robert Rede's lecturer. In 1854, in consequence of representations originating with the British Association, our Government created a special department in connexion with the Board of Trade, under Admiral Fitzroy, for obtaining hydrographical and meteorological observations at sea, after the manner of those which had been for some years before collected by the American Government at the instance and under the direction of Lieutenant Marcy. Observations on the wind have been carried on by means of the various self-registering anemometers of Dr. Whewell, Mr. Osler, Dr. Robinson, and Mr. Beckley, which instruments have been improved, tested, and thoroughly brought into practice by the fostering care of our body; and by the aid of its funds experiments have been made on the subterranean temperature of deep mines, and on the temperature and other properties of the atmosphere at great heights by means of balloon ascents. Four of these were made in 1852, in which heights between 19,000 ft. and 20,600 ft. were reached. But in the present year Mr. Glashier has attained an altitude of nearly 30,000 ft. We may hope that some account of this daring achievement, and its results to science, may be laid before the association at its present meeting. Earthquake shocks were registered in Scotland by a committee of the association from 1841 to 1844, and Mr. Mallet commenced in 1847 a most valuable series of reports on the facts and theory of earthquake phenomena from the earliest records to our own time, which have graced our volumes, even to the one last published. One of the most remarkable and fruitful events in our history in relation to physical observations, is the grant by Her Majesty in 1842 of the observatory erected at Kew by King George III., which had been long standing useless. It gave to the society a fixed position, a depository for instruments, papers, and other property, when not employed in scientific inquiry, and a place where members of the association might prosecute various researches. This establishment has been during the twenty years of its existence, gradually moulded into its present condition of a most valuable and unique establishment for the advancement of the physical sciences. After the first few years its existence was seriously perilled. In 1845 the expediency of discontinuing this observatory began to be entertained, but upon examination it appeared that the services to science already rendered by this establishment, and the facilities it afforded to members of the association for their inquiries, were so great as to make it desirable to maintain it, Again, in 1418, the burden of continuing this observatory in a creditable state of efficiency pressed so heavily upon the funds of the association, then in a declining state, that the Council actually recom-

mended its discontinuance from the earliest practicable period. This resolution was happily arrested. In 1850 the Kew Committee reported that the observatory had given to science self-recording instruments for electrical, magnetical, and meteorological phenomena already of great value, certainly capable of great further improvement, and that if maintained merely as an experimental observatory, devoted to open out new physical inquiries and to make trial of new modes of research, but only in a few selected cases to preserve continuous records of passing phenomena, a moderate annual grant from the funds of the association would be sufficient for this most valuable establishment for the advancement of the physical sciences. In this year it fortunately happened that Lord J. Russell granted to the Royal Society the annual sum of £1,000 for promoting scientific objects, out of which the society allotted £100 for new instruments to be tried at Kew—the first of a series of liberal grants which have very greatly contributed to the increasing efficiency of the establishment; but we have insured its continuance. It now contains a workshop fitted with a lathe, tools, planing-machine. &c., by which apparatus can be constructed and repaired, and a dividing engine for gaaduating standard thermometers, all presented by the Royal Society. The work done, besides the maintenance of a complete set of self-recording magnetographs, established in 1857, at the expense of £250, by the Royal Society. consists in the construction and verification of new apparatus, and in the verification of magnetic, meteorological, and other instruments sent for that purpose by makers. For example, all the barometers, thermometers, and hydrometers required by the Board of Trade are admirably tested, and standard thermometers are graduated, magnetic instruments are constructed, and their constants determined for foreign or colonial observatories. Sextants also are verified. An example of its peculiar functions is given in the very last report for 1861, when it appears that an instrument contrived by Professor William Thomson, of Glasgow, for the photographic registration of the electric state of the atmosphere, has been constructed by Mr. Beckley, in the workshop of this observatory, with mechanical arrangements devised by himself, and that it has been in constant and successful operation for some time. Those who have experienced the difficulty of procuring the actual construction of apparatus of this kind devised by themselves, and the still greater difficulty of carrying out the improvements and alterations required to perfect it when brought into use, will agree that the scientific importance and utility of an establishment cannot be overrated in which under one roof are assembled highly skilled persons, not only capable of making and setting to work all kinds of instruments for philosophical research, but also of gradually altering and improving them as experience may dictate. The creation of this peculiar observatory must be regarded as one of the triumphs of the British Association. As far as the association is concerned, its maintenance has absorbed between £5,000 and £6,000, and the annual sum allotted to it from our funds has for each of the last six years reached the amount of £500. The construction of the photoheliograph may be quoted as an example of the facilities given by this establishment for the developing and perfecting of new instruments of observation. A suggestion of Sir John Herschell in 1854 that daily photographs of the sun should be made, has given birth to this remarkable instrument, which at first bore the name of the solar photographic telescope, but is now known as the Kew photoheliograph. It was first constructed under the directions of Mr. De la Rue, by Mr. Ross, &c. The British Association aided in carrying out this work, by assigning the dome of the Kew Observatory to the instrument, and by its completion in 1857, in their workshop, by Mr. Beckley, the assistant; but the expense of its construction, amounting to £180, was supplied by Mr. Oliviera. On occasion of the eclipse in 1860, this instrument was conveyed to Spain, under the care of Mr. De la Rue, who most successfully accomplished the proposed object by its means, and was replaced at Kew on his return. But to carry on the daily operation for which it was constructed, requires the maintenance of an assistant, for which the funds of the association are inadequate, although it has already supplied more than £200 for that purpose. Mr. De la Rue, in consequence of the presence of the heliograph at Kew being found to interfere with the ordinary work of the establishment, has kindly and generously consented to take charge, for the present, of the instrument at this observatory, and at his own observatory when celestial photography is carried on. But it is obvious that the continuation of these observations for a series of years, which is necessary for obtaining the desired results, cannot be hoped for unless funds are provided. I cannot conclude this sketch of the objects of the physical section to which the funds of the association have been principally devoted, without alluding to Mr. Scott Russell's valuable experimental investigations on the motion and nature of waves, aided by £274. If we now turn to geology, we find £2,600 expended; of which £1,500 was employed in the completion of the fossil ichthyology of Agassiz, and Owen's reports on fossil mammalia and reptiles, with some other researches in fossils. The remainder was principally devoted to the survey and measurement, in 1838, of a level line for the purpose of determining the permanence of the relative level of the sea and land, and the mean level of the ocean, and to the procuring drawings of the geological sections exposed in railway operations before they are covered up—a work which was carried on from 1840 to 1844, when the drawings were deposited in the Museum of Practical Geology, and the further continuance of it handed over to the geological surveyors of that establishment. £2,300 has been devoted to the carrying out of various important experimental investigations in relation to the section of mechanical science. Of this sum £900 was paid between 1840 and 1844 in aid of the most important and valuable series of experiments on the forms of vessels, principally conducted by Mr. Scott Russell, in connexion with the experiments on waves. This investigation was ready for the press in 1844, but it is greatly to be regretted that the great expense of printing and engraving it has hitherto prevented its publication. Nearly the same sum has given to us various interesting and instructive experiments and facts relating to steam engines and steam vessels, carried on by different committees from 1838 to the present time, among which may be especially noted the application of the dynamometric instruments of M.M. Morin, Poucelet, and Moseley, to ascertain the duty of the steam engines from 1841 to 1844. Experiments on the strength of materials, the relative strength of hot and cold blast iron, the effect of temperature on their tensil strength, on the effect of concussion and vibration on their internal constitution, carried on principally by our late president, by the late Mr. Eaton Hodgkinson at different intervals from 1838 to 1856, have been aided by grants, amounting to £400. The remainder of the sum above-mentioned was principally devoted to the experimental determination of the value of railway constants by Dr. Lardner and a committee in 1838 and 1841. The section of botany, zoology, and physiology has absorbed about £1,400, of which nearly £900 has been applied to zoology, partly for the expense of dredging committees, for obtaining specimens of marine zoology on our own coasts, and in the Mediterranean and other localities, and whose useful labours have been regularly reported from 1840 to 1861, but principally for zoological researches in different districts and countries. In botany may be remarked the labours of a committee, consisting of Professors Daubeny, Henslow, and others, formed in 1840 to make experiments on the preservation of vegetative powers in seeds, who continued their work for sixteen successive years, reporting annually, and assisted by a sum of £200. The greatest age at which the seeds experimented upon were found to vegetate was about 40 years. Another committee, with Mr. Hunt, was engaged during seven years, from 1841, in investigating the influence of coloured light on the germination of seeds and growth of plants. These are specimens of the admirable effect of the organization of an association in stimulating and assisting with funds the labours of investigators in new branches of experimental inquiry. It would occupy too much time to particularize a variety of interesting investigations in the remaining sections to which small sums have been assigned." The President then referred to the report of the Manchester meeting, and instanced some of the most striking advances since made in the various sciences. He the said:—"Before I conclude I have the painful duty of reminding you that since our last meeting we have had to deplore the loss of that most illustrious patron of science and art, his Royal Highness the Prince Consort, the president of our association at Aberdeen, and the chancellor of this university. In the latter capacity he afforded us many opportunities of observing his scientific attainments and genuine zeal and love for all branches of knowledge. His gracious kindness and respect for men of science and literature have left an impression upon us that can never be effaced. I must also ask a tribute to the memory of our late professors of chymistry and botany, both of whom did in their lifetime excellent good service to science, and more especially to the British Association—Professor Cumming contributing one of the invaluable primary reports upon which our proceedings were based, as well as other communications—Professor Henslow by various reports, some of which I have already alluded to." The Professor was loudly cheered during the delivery of his address. At its close—

Professor Owen, who was loudly cheered, moved a vote of thanks to the learned president for his comprehensive, varied, and excellent address.

The Dean of Ely seconded the motion. The clergy of the Church of England most cordially recognized the excellence of the work of the British Association, and with all heartiness and solemnity wished them God-speed in their great work. (Cheers.)

The resolution was carried with acclamation.

Professor Willis acknowledged the compliment; after which the meeting broke up.

NEW JETTY AT DEVONPORT DOCKYARD.

An important and rather extensive work has just been completed at the Royal Dockyard, Devonport. It consists of an addition to what has been heretofore known at that establishment as the "Anchor Wharf," the name of which sufficiently well indicates the purpose to which it was devoted. The enormous increase in the strength of the British steam navy during the last few years has rendered it a matter of absolute necessity to increase, commensurately therewith, facilities for supplying it with coal. It is to this end that the new jetty at Devonport has been constructed. The structure does not extend itself into the harbour at right angles from the face of the anchor wharf, as its name might seem to imply, but runs parallel with that erection. The jetty is 350 ft. long and 40 ft. wide. A row of cast iron piles, each of which is 36 ft. in length, and weighs 3½ tons, forms the outer line of the jetty, and gives great stability to it. As the bed of the harbour is composed of tolerably hard limestone rock, the pitching and driving of the piles has been attended with considerable mechanical difficulty and much labour. Now that they are all in their places, however, they may be deemed immovable, and almost imperishable, and this fact compensates, to some extent, for the exertions used in implanting them.

The heads of the iron piles stand about 10 feet above low water mark, and are fitted with sockets for the reception of timber uprights for the support of the superstructure. These sockets are each 2 ft. 6 in. in depth, and 2 ft. 4 in. by

1 ft. 2 in. in width, whilst the double timber uprights resting in them are each 15 ft. in length, and iron-capped, for the reception of cross girders, which are also of cast-iron. The length of the girders is 21 ft. each, and the weight 2 tons. Their inner ends rest upon an intermediate row of piles, similar to those described, whilst another series of girders connects the whole to the face of the old wharf. On the tops of the girders are placed joists, 14 in. by 7 in., and spiked down to these is a flooring of oak, $4\frac{1}{2}$ in. in thickness, and laid diagonally, for the purpose of imparting additional strength to the erection. The jetty is formed in bays, or spaces, each 13 ft. from centre to centre. Diagonal framings of whole timbers again connect the piles to the wharf wall, whilst longitudinal timbers unite the piles and braces to each other. In the front of each bay there are also wrought-iron tye rods, which cross each other, and add yet further strength to the work. Rubbing pieces, composed of whole timbers, are bolted to the front of the outer line of piles, so as to prevent mischief arising from the impact of heavy vessels lying alongside, and disturbed by the swell. At the average height of spring tides there is forty feet of water at the new coaling jetty, so that the largest steam ships at present employed by the British government may approach it without the slightest danger of grounding. Seen from the water the new jetty, although, as we have shown, of massive proportions, has a peculiarly graceful and light appearance, and it adds indeed a new and pleasing feature to the outline of the dockyard. It will, therefore, prove not only useful but ornamental.

The work was designed, and has been constructed by Henry Grissell, Esq., of the Regent's Canal Iron Works, Eagle Wharf-road, London, a gentleman whose successful efforts in the way of iron bridge building, and the erection of dock roofs, lighthouses, piers, &c., &c., have obtained for him a high reputation. Nine months have sufficed for the completion of the jetty, and to Mr. Gideon Scott, manager at Devonport for Mr. Grissell, belongs the credit of having personally and practically directed the whole of the proceedings in connexion with it. No accident occurred during the progress of the work, which is destined, we imagine, to remain for centuries as a testimony to the marine engineering skill of Mr. Grissell and his assistants.

Correspondence.

THE WAVE-LINE THEORY.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—It is easy to refute Mr. Moy, but hard to convince him. But the "inexorable logic of facts" has been operating upon the Wave-line theory since Mr. Moy read his paper in 1857. And that theory is now regarded by most practical naval architects as an hallucination. A bow having its water-line a concave curve from the stem to an indefinite distance aft, and there joined to a convex curve, which unites it—at an indefinite distance further aft, to the side of the ship, is now generally understood to be a wave-line bow. Mr. Moy demurs to such a bow being so designated. Very well! The term may be a misnomer. But there are persons who designate some water-lines *plumb-bolt lines*, and Mr. Moy's water-lines *winch-handle lines*. "What's in a name?" The important fact, patent to everybody connected with ship building, is, that the pretentious advocates of the wave-line—whatever it may be—have utterly failed to establish its practical pre-eminence.

Mr. Moy can see, according to his own exposition of his theory, a close analogy existing between a force exerted upon one extremity of a crank, the other extremity of which is held by an axis upon which it revolves, and the pressure of a ship's bow cleaving her way through water, every particle of which moves freely in any direction which the complicated forces acting upon it may necessitate—I cannot. His laws of induction and mine differ. So we had better not discuss theory. With regard to facts, an extended experience enables me to say, they are against him. Has he ever made any inquiries respecting the little yacht "Titania," and the large steamer "Adelaide," both constructed upon the orthodox wave-line principle? The reports which have been made to me of both are very unfavourable. Has he ever ascertained, with regard to the two vessels he mentions, their length, displacement, indicated horse-power, and speed, and compared them with similar data of many steamers not having wave-line bows? He should do so. The result might shake his convictions.

Mr. Moy boldly and explicitly expresses his opinions, and attests them with his name. For this he is deserving of respect, and I should be sorry to write anything that would jar upon his feelings. But sincerity and enthusiasm, however admirable, may produce fanaticism in science as well as in religion, and I crave Mr. Moy's pardon for having arrived at the conclusion that his intense regard for the wave-line arises more from the suggestions of his imagination, and his aversion to giving up an untenable position, than to any process of philosophical experiment or ratiocination.

I have now the lines of the *Yankee* yacht "America" before me. And I can assure Mr. Moy that she has scarcely more concavity in her load line than would be sufficient to break in the straight line of the stem to the convex line of her bow without an angle at the "hood ends." If the drawing of the fore-body were submitted to him, he would at once repudiate it as a wave-line bow. But supposing otherwise. Has not the superior sailing of the "America" been traced to her sails and management? Would any yachtsman now build a yacht upon her model? It may, moreover, be fairly urged that whatever the excellence of horizontal "wave lines" may be, as fore-and-aft-rigged vessels are always considerably deflected while under weigh, the *actual* water line forms a widely-diverging diagonal line with such horizontal lines, and, consequently, differs very widely from them in character.

Since your last publication I have made every enquiry in my power respecting the Duke of Sutherland's yacht, now lying in the Victoria dock. Mr. Moy will admit that she is a veritable wave-line bowed yacht. I have conversed with parties knowing all about her from the time of her keel being laid on the blocks till her return from Russia. I find that my impression of her is abundantly confirmed by her behaviour. She is, as far as speed is concerned, a failure. Esthetics do not pertain to our argument or I might be tempted to dilate also upon her ugliness.

I am averse to controversy, and shall therefore allow Mr. Moy to have the last word, unless he challenges the veracity of any of my statements. Before concluding, I must confess myself sorely mortified by Mr. Moy throwing down the gauntlet upon such a *trifling* affair as the construction of a vessel to steam twenty miles an hour. Why, I have been anxiously waiting three years for his vessel, then *in passe*, which he assured us would go fifty miles an hour. Twenty miles an hour, forsooth, who would not deem it *in fra dig* to waste time, ink, and drawing paper upon such a sluggish creeping thing, with the prospect of a *fifty miler* before him? No! no! I shall try my hand at nothing less than an amendation of that prodigy *when it appears*.

NAUTICUS.

P.S.—The "Psyche's" bows can no doubt be very much improved without adopting the wave line.

HOW TO PURIFY AIR IN WELLS.

SIR,—Within the last few days no less than five lives have been lost in wells. In one they threw down fire and water for a counteraction; water may have been of service, but as for the fire, I consider it useless.

If chance threw me in the way of such a calamity, I should make use of a well rope, clothes line, bed cords, or anything suiting the occasion, to attach to an umbrella, a parasol, copper lid, tea-tray, carpet, a sack with hay or straw in it, blanket sheet, or coat; and with any of those articles, or more if means allowed, I should drop it down the well, draw it partly up, down again, now up all the way; do as before over and over again until the air was so disturbed and changed that one might venture down in safety, and the one or those below would be relieved before got at.

I am of opinion that the following advice should be widely circulated:—Disturb the air in the well with the first thing at hand, and lose no time in doing it, for quickness will prolong vitality in the well.

If some of your readers who can have access to a well were to get some squibs, and by means of a cord let two or three off near the bottom, and note the time the smoke lingered there, then let off other squibs again, supposing a friend below in jeopardy. Now set to work in real earnest with something to the purpose, and each stroke will tend to dilute and change the air contained there.

Suppose a tank of water five feet deep, and a tube four feet long and 2 in. diameter, closed at bottom, and standing in the tank; there shall be at the bottom of the tube 3 in. of porter or muriatic acid, the rest is water, of course, and this said tube we will call a well, the water to represent air, and the other foul air—

Question—Is it possible, with a metal button attached to a thread, to rid such a tube of the foul portion?

I say yes.

Yours respectfully,
GEORGE BOURN.

67, Murray-street, Hoxton,
Sept. 29, 1862.

PROTECTING SHIPS' SCREWS.

SIR,—Your correspondent, Mr. Cunningham, has handled this important subject so ably and fully, in enumerating the many disasters arising from the fouling of screw propellers, that to pass by unheeded his timely warning would approximate to insanity.

Mr. Cunningham is in error, however, in stating that the fouling of the screw has been uncared for; as far back as 1853 the subject engaged my attention, and, after considerable study, I discovered that screw-protectors could be *dispensed* with, simply by altering the shape of the blades, and constructing them *round*—the tendency of this formation being to *throw off* everything coming in contact; and had the Confederate steam-ram, "Arkansas" (referred to by Mr. Cunningham) been fitted with a screw so constructed, she could have defied everything in the shape of ropes, chains, or spars; therefore, to advocate the adoption of screw-protectors, however simple, is not only a waste of time but of money also, especially as the remedy is so easily and effectually secured by altering, as we before observed, the shape of the blades. (See MECHANICS' MAGAZINE, June 10, 1859.)

Permit me to embrace this opportunity of thanking Mr. Cunningham for the illustrations of his patented protector, which my previous letter called forth. I admit its simplicity; at the same time, it possesses two serious and insurmountable drawbacks, viz.—it would be an infallible receptacle for sea-weed, &c., also an obstruction to the ship's progress.

I am, Sir, faithfully yours,
WILLIAM HEWITT.

Bristol, September 26, 1862.

SIR,—In your Magazine of the 19th inst., you give a drawing of a patent improved watch regulator, by N. Wighton. I beg to inform you that that invention is nothing new, having been proposed by me to Messrs. J. and H. Marshall, of Edinburgh, several years back, but they told me that it had been tried and did not answer, and showed me a motion which is cleverly expressed by the words in your notice from "a quadrant" to "turned," but very coarsely manufactured. I mentioned the same proposal to a scientific watchmaker and great mechanic a short time ago, but was told it was no practical use.

Your obedient servant,
COPPER CAP.

September 29, 1862.

THE IRON-PLATED RAM "DEFENCE."

SIR,—Considerable interest has been excited respecting this ship by a paragraph which appeared in the *Times* some few weeks ago stating that she had knocked a large hole in her bottom, had filled two compartments with water, and was only saved from sinking by her water-tight bulkheads. This cock-and-a-bull story turns out to be entirely imaginary, and seems to have been got up to gull the leading journal on the question of *iron ships*. On inquiry we find that the "Defence," after passing the Cattegat, touched the ground during her cruise in the Baltic *three* times. The two first times the points touched were presumed to be either sand or soft mud. The third time, on the passage from Stockholm to Revel, she passed over a rock. The officers describe the sensation of passing over the rock as something horribly unpleasant. One officer stated that he was nearly thrown off the bridge on the deck; several got out of bed and rushed on deck, the vessel going at the time about eight knots an hour. At the same time she was observed to make a regular plunge, rising first at the bow, and then at the stern, some five or six feet. After this

a leak or leaks were fully expected, but nothing appeared to give the slightest foundation for the strange report in the *Times*.

The ship has just been put into dock at Portsmouth, and after a careful inspection some half-dozen rivets were found started, but every plate and joint in the bottom found as sound and good as the day the vessel was launched. It is agreed by all on board that had she been a wooden vessel she would have stuck fast on the rock and injured herself very severely. All the officers (many of whom went away very much prejudiced against the ship) now speak in unqualified praise of her good qualities. They say she is as steady as a church, neither pitching nor rolling. She can both steam and sail (though lightly rigged) with any vessel in the fleet. In fact, they have returned home after a very pleasant cruise, in which the qualities of the vessel have been well tested, and they themselves treated by Swedes, Danes, and Norwegians in a right royal and hospitable manner, fully convinced that there is more in the iron ships than they had ever dreamed of in their philosophy.

J. S.

OVERLOADING OF VESSELS.

SIR,—In your Magazine of the 26th inst., when alluding to the number of vessels wrecked in 1861, you say, "with causes so well defined is not the remedy obvious?" There is one remedy I have long advocated, viz.,—that every vessel should have a light and a load water line so marked as not to be easily effaced. The former should never show on an outer bound vessel, the latter should always be in sight. Some years back a bill was passed to prevent the overloading of stage coaches—why should not there be a bill to prevent the overloading of vessels. Hundreds of lives and millions worth of property would be saved annually by such a measure.

I remain, yours truly,
A. W. SKINNER, Captain, R.N.

Belfast, 27th Sept., 1862.

PRODUCTION OF CORK.

IN the "Mémoires de la Société de Physique" of Geneva, is an interesting paper by M. Casimir de Candolle on the growth of cork. Although this useful substance exists in varying quantity in the bark of all phanerogamous plants, and in several cryptogamous, yet for commercial purposes it is wholly procured from two species of oak, *Quercus occidentalis*, growing in the south-west of France and in Portugal, and from *Quercus Suber* (the cork tree), growing in the south-east of France, in Italy, in Algeria, and in the isles of the Mediterranean. The acorns of the former species take two years to ripen. In 1859 M. C. de Candolle, while staying in Algeria, studied the development of the bark of the latter species. It is composed of four layers—the epidermis, the corky envelope, the cellular envelope, and the liber which covers the soft wood. These four parts increase independently of each other year by year. In the third or fourth year the epidermis, having attained the limits of its elasticity, splits longitudinally, and a marked change takes place in the corky envelope, which gradually takes up the appearance of true cork; new layers are produced, and the transformation of cellulose into cork steadily goes on. The cork thus naturally developed has no commercial value. It is termed "male," and the first act (*demasclage*) of the cultivator is to separate it from the trunk, which thus leaves exposed the liber, termed "mother." The tree is then left to itself, and the cork begins to grow again, while the sap is flowing, in consequence of the exposure of the liber. If a trunk left in this state several months be cut down, in the section a ring of cork will be found formed in the interior of the "mother," at a variable distance from the surface of the trunk. All the exterior portion of the "mother" is dead, and splits as the tree grows, and the interior portion (new cork, termed "female") is developed. This "female" cork grows in the same manner as the "male," that is, by the addition of annual layers on the internal surface; but it is much finer and more elastic, and is the cork of commerce. These various stages of growth are exhibited in a series of beautiful plates. In the course of his researches M. de Candolle was led to observe the importance of the desiccation of the "mother," and to infer that, in proportion as this desiccation could be hastened, so much sooner would fresh layers of cork be produced. This idea he found to be correct. He observed several trees in which fires, after having charred the male or female cork, had determined the formation of a layer of female cork in the interior of the "mother." He states that he has seen a specimen, composed of three layers of "female" cork, separated by little zones from the "mother," the fourth layer, which enveloped the whole, having disappeared in consequence of the fire. The thickness of these zones, increased by the application of boiling water, does not diminish by cooling. Other peculiarities of this remarkable substance are noted in the memoir.—*The Building News*.

SPRAY SUPER-HEATING STEAM ENGINE.

A SHORT time since a patent was taken out in this country to generate steam on an ingenious principle, and we now see, from the *Scientific American*, that a steam engine working on the principle, may be seen in New York. "We will briefly state," says that journal, "wherein the invention differs essentially from the ordinary steam engine. For the latter, as every body knows, a boiler is used containing a considerable quantity of water, to which the heat of the furnace is most directly applied, and from which the steam is generated. Such a boiler is a magazine of force, because it contains a far greater amount of steam and heated water than is required to supply the engine at each stroke. Herein consists the danger from explosions in common boilers. A hot-air engine has no magazine of force like a steam boiler. Its heater is supplied with the exact amount of air requisite for each stroke, hence its immunity from explosion. This new engine embraces a similar principle. It has a peculiarly-constructed heater, into which the exact quantity of water for each stroke is fed, in the form of spray, then it flashes into steam and passes over an extended heated surface to the working cylinder."

The engine exhibited is single-acting, and of the following dimensions:—Its steam cylinder is 7 inches in diameter; the stroke of piston, 7 inches. It is situated upon a small tank 30 by 34 inches, which forms the bedplate and the heater of the feed water. The feed pump has a stroke of one-fourth of an inch, and the water is fed through a ¼-inch pipe, the steam heater, outwardly, resembling a vertical cylindrical stove. It is 13 inches in diameter, and 30 inches in height. There are 19 double tubes inside and the steam passes between these and is heated on two sides. The circular grate containing the fire is capable of being adjusted by a lever and set at any required distance from the bottom of the heater. We have examined this engine working with super-heated steam at 50-pound pressure, and running at the rate of 87 strokes per minute. The steam exhausts into the tank upon which the engine stands; the feed water, nearly at the boiling temperature, is conveyed into the heater in a fine shower through a small conical chamber on the top of the heater. A small quantity of superheated steam is contained in the heater, and the feed water, in the form of spray, is instantly converted by it into saturated steam. The pipe for supplying the cylinder with steam is situated nearly at the bottom of the heater, hence the saturated steam formed from the feed-water at the top of the heater has to pass in a current between the double tubes on its way to the cylinder, and it thus flows over a very extended heating surface and becomes superheated. A constant current of steam is maintained in this manner over the heated surfaces of the tubes. By such a heater, and such arrangements of the parts of the engine, nearly all the heat is economized, and a perfectly safe steam-engine is secured. If the feed pump were to cease working, or the supply of water to become exhausted, the heater would become like an empty oven after a few strokes, and the engine would stop of itself. For pumping water, printing presses, sawing wood, and various operations requiring a small moter from 1 to 10-horse power, this engine appears to be well adapted, as it is compact, safe, and easily controlled.

DISCOVERIES AT POMPEII.

UNDER the government of the Neapolitan Bourbons, it was the custom to unearth a house at Pompeii on the occasion of a visit from some illustrious guest of the king. The visitor was allowed to pay the expenses of the honour conferred upon him. A fear was entertained that if all the buried treasures of the city were at once exposed, all interest in the discoveries would gradually die out, and "strangers' money" would soon be wanting to gladden the eyes of Neapolitans. Moreover, if the work had been at once completed, the king must of necessity have paid the expenses. Thus, by spreading it over a number of years, the appetite for antiquities was fed but never satiated, and the cost of entertainment did not tax the king's pocket. The "Ré Galantuomo" does not, it appears, act on this shabby system, for we hear that no less than three houses have within the last month been exposed to view. One is of unusual extent and magnificence, and is enriched with wall-paintings of rare design and workmanship. It forms another illustration of the 6th book of Vitruvius, wherein the domestic architecture of the Romans is so minutely described, and recalls Pliny's account of the luxury and splendour in which the more favoured citizens indulged; but neither Crassus, Pollio, or Lucullus, would ever have placed "Salve Lucrum," as we find the ashed-out owner of the latest discovered villa has done, upon his door-step. We have heard already of "salve" and of "cave canem," and we have seen them repeated upon English door-mats, but the new inscription will have, we fancy, no duplicates made of it.

The other discovery is a baker's shop, which has, of course, been closed for nearly 2,000 years, but in which everything has remained in such order that the baker might be supposed to have just left it, and might be momentarily expected to return and resume his vocation.—*Building News*.

Gossip.

It has been discovered that when gas pipes constructed of copper or bronse have been long submitted to the action of ordinary coal-gas an explosive compound of copper and acetylen (one of the many ingredients of coal-gas) is formed. When dry, this compound detonates with extraordinary violence as soon as it is rubbed, struck, or heated. Already some accidents have occurred, and some workmen have lost their lives while cleaning large copper gas pipes, from this circumstance. No such explosive compound appears to be formed when iron or lead are used. It is evident that large copper gas-pipes are unsafe, and that some other metal should be substituted for the copper, as the latter may give rise to explosions at any moment. As concerns small pipes constructed of this metal, they should not be allowed to get foul, and when about to be cleaned hydrochloric acid should be introduced into them for about ten minutes before they are submitted to any heat or friction. Hydrochloric acid decomposes the explosive compound, combines with the copper, and puts the gas acetylen in liberty. The acid may then be washed out with hot water.

The Pittsburgh *Chronicle* states that the Fort Pitt works in Pittsburgh, are turning out the immense fifteen-inch guns now at the rate of three a week. These guns weigh each in the rough about 70,000 lbs., and, apart from the difficulty of casting, the labour of handling, turning, and finishing such a mass of metal must be immense. There are four of these guns now in the lathe, and by the time these are out others will be ready to take their place. It is the intention to turn out three a week, we believe, for the balance of the year. These guns are intended for the new "Monitors," and are the most formidable of their character in the world. Arrangements are now in progress for casting a twenty-inch gun. This latter gun will throw a ball of one thousand pounds, and is expected to have a range of four miles.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

The Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the Proprietors of this Magazine. Other Papers are hereby warned not to produce them without an acknowledgement:—

Steam Engines, &c., 691.
Boilers and Furnaces, 670, 672, 684, 689.
Roads and Vehicles, including railway plant and carriages, saddlery and harness, &c., 666.
Ships and Boats, including their fittings, 695.
Cultivation of the Soil, including agricultural implements and machines.
Food and Beverages, including apparatus for preparing food for men and animals.
Fibrous Fabrics, including machinery for treating fibres, pulp, paper, &c., 678, 683, 685, 686.
Buildings and Building Materials, 680.
Lighting, Heating, and Ventilating, 664, 673, 692, 698, 705, 722.
Furniture and Apparel, including household utensils, time-keepers, jewellery, musical instruments, &c., 687, 693, 696, 703, 711, 713, 716, 728, 729.
Metals, including apparatus for their manufacture, 704.
Chemistry and Photography, 677, 681.
Electrical Apparatus, 665, 708.
Warfare, 679.
Letter-Press Printing, &c., *none.*
Miscellaneous, 662, 663, 667, 668, 669, 671, 675, 676, 682, 688, 698, 700, 701, 706, 714, 715, 721, 723. 726, 727.

662. G. Davies. *Improvements in attaching artificial teeth to plates and to each other, and in moulds for forming artificial teeth.* (A communication.) Dated March 11, 1862.

The first part of this invention consists in securing artificial teeth to metal plates, by interposing between the said teeth, by plates, a strip or mass of gum or india rubber, and vulcanizing or hardening the same, after the teeth have been adjusted to the plate; also in forming dove-tailed recesses in artificial teeth, for the purpose of securely attaching the teeth to the plate and to each other by vulcanizable gum, or any other suitable cement; also in the use of staples embedded in artificial teeth as a means of securing the latter to vulcanizable gum plates in the manner described. The second part of the invention consists in making moulds for forming artificial teeth, substantially as described, so that depressions of any size or shape may be formed in the bases of the teeth. In attaching teeth to a metal plate by means of vulcanizable gum, a plate of the desired form is first prepared by any of the known processes, and at the point where the teeth have to be secured, a metal rib is soldered or otherwise secured to the plate. This rib may be plain, but it is preferable to make it thicker on the outer edge than it is at the point where it is secured to the plate, or the rib may be perforated or serrated. In the teeth, or block of teeth, as the case may be, is formed a groove or recess, to coincide with the rib or projection of the plate, the groove being somewhat larger than the rib, and dovetailed, as explained hereafter. A strip or sheet of vulcanizable gum is placed over the rib of the plate, care being taken to keep both the teeth and plate warm. The teeth are now applied to the plate and pressed tightly against the same, so that the rib of the plate may penetrate the groove of the teeth, carrying with it a sufficient quantity of gum to make a tight joint, and to fill up all irregularities or interstices. The whole is then placed in a mixture of plaster of Paris and whiting, and the gum subjected to a vulcanizing or hardening process, when the block of teeth will be found to adhere with the required tenacity to the plate, the interstices in the block and between the block and plate being filled with the vulcanized gum, and the joint presenting a smooth and uniform appearance.—*Patent completed.*

663. W. Clark. *Improvements in apparatus for effecting submarine operations.* (A communication.) Dated March 11, 1862.

This invention relates to the construction of a submarine boat, applicable as an engine of warfare, or for other submarine operations. The boat is formed of two concentric cylinders, having a space between them in which to introduce water to any desired amount, for the purpose of increasing the weight of the boat, and so cause it to sink. This water chamber may also be emptied by means of reservoirs placed in the interior of the boat, the water being ejected behind, for the purpose of lightening the boat, and causing it to rise to the surface. The inner and outer cylinders are independent of each other, so that the movements of the exterior cylinder shall not interfere with those of the inner one, which should always retain its normal position. An ether, or engine and boiler are placed in the boat for imparting motion to a screw propeller, and also for emptying the water contained in the chamber between the two cylinders. The boat is also furnished with instruments of destruction or working tools, according to the purpose to which it is to be applied. Its equipment also includes electric apparatus, steering gear, with manholes suitably arranged, and buoys.—*Patent abandoned.*

664. A. R. L. De Normandy. *Improvements in connecting gas and other pipes.* Dated March 12, 1862.

For the purposes of this invention the pipes to be connected are made plain at their ends, that is to say, without sockets, flanges, or projections, and a disc or plate with a hole in the centre of it—the diameter of which should be rather larger than the external diameter of the pipes—is then slipped over the ends of each pipe, and a washer or packing of vulcanized india rubber, smaller than the pipes to be united, is then slid over each end of the said pipes, so as to grip them tightly; or a washer of other suitable material other than vulcanized india rubber, such, for example, as gasket and tallow, or gasket and red lead, or other similar or analogous substance is used; the said gasket should be tightly wound round the end of each of the pipes, leaving, however, a portion of each pipe to protrude beyond the said washers or packing, and afterwards over the ends of the pipes and between the said washers or packing a short length of tube or plain socket, made just to fit loosely to the exterior of the pipes, is passed. The ends of the pipes to be connected are then butted end to end, so as to meet about midway within the short exterior tube, or loose socket, and the plates or discs are drawn towards each other by bolts, the washers being by this means compressed between the plates or discs and the ends of the short tube, and a secure joint is thus made.—*Patent completed.*

665. A. J. Russell. *Improvements in the arrangement of the electric conductors for submarine telegraphs.* (A communication dated March 12, 1862.)

This invention consists in twisting, coiling, or winding the conducting wires for submarine telegraphs around the cable or core, that is, giving them the form and direction of helical or spiral wires, instead of straight longitudinal wires, as heretofore adopted; and the inventor now uses from one to eight or more such twisted or coiled wires or conductors, the insulation of each being insured by a covering of silk; and over this he now prefers to use a covering or insulator of gutta percha or india rubber, and over this again a covering of hemp that has been steeped in tar, grease, and such like substances, and over all the external sheath composed of small cords of hemp, or of hemp and fine steel wire, that has been steeped in grease, tar, and such like substances.—*Patent abandoned.*

666. J. Fawcett. *Certain improvements in the manufacture of cranks, and crank axles for locomotive and other engines.* Dated March 12, 1862.

This invention consists in making such cranks hollow instead of solid as heretofore. The mode of making cranks for locomotive and other engines according to this said invention is by taking a number of bars of fibrous iron and welding the same together in the form of a tube, and afterwards bending them to the required form, for a crank, which crank the inventor prefers to make hollow from end to end. The same may, however, be made solid at each end of the crank shaft, and hollow in the cranked parts. He also proposes to make such cranks by casting in steel or other metal, in which case he prefers to introduce a core so that the cranks may be hollow when cast.—*Patent abandoned.*

667. W. H. Latham. *Certain improvements in machinery or apparatus for perforating and numbering paper or other substances to be employed as "tickets," or where other "counter registration" is required.* Dated March 12, 1862.

This invention consists in the combination of two machines, one for perforating the blank sheets to sub-divide it into the forms required, and the second part for numbering, the passage of the sheets being either continuous or separate. The apparatus for perforating consists of any number of discs arranged in pairs and sliding upon rotating triangular bars, the upper discs being provided with pins, and the lower discs having corresponding orifices in their peripheries, so that, as the paper or other material passes between them, the perforations are effected, the orifices receiving the pieces as they become punched out. It will be evident that this arrangement of machinery may also be employed for perforating in instances when numbering is not required. The apparatus for numbering being a second part of the invention, consists in the employment of a series of change rings, having the numerals projecting from the surface, and arranged as required, the unit ring being from 1 to 10, the rings having registering holes fitting on to pins on the shaft upon which they are arranged to insure precision; or it may be so arranged as to use flat bars of numerals placed side by side. The rollers for supplying ink to the said rings are moved by a cam and lever, so as to come into contact with the main ink roller, and transfer the ink to the projecting figures, the paper or material to be printed passing between them and a bed roller beneath.—*Patent completed.*

668. W. H. Latham. *Certain improvements in machinery or apparatus for cutting paper, pasteboard, and other similar substances.* Dated March 12, 1862.

This invention relates to that class of machines used for cutting paper wherein a vertical descending knife or blade is employed, and consists in imparting a motion to such blade which shall cause the blade to describe an entire circle from the commencement of its movement in descent to the completion thereof in its ascending course, by which means the patentee is enabled to obtain a better cut, and with cleaner edges of the paper or other material than hitherto. The motion is effected by means of cams, eccentrics, or cranks connected to the blade and actuated by a pair of worm wheels driven by worms on the driving shafts, no guiding or parallel bars being required.—*Patent completed.*

669. A. Watson. *Improvements in hot-pressing apparatus.* Dated March 12, 1862.

According to one modification of this invention, an improved plate is formed by taking two malleable iron plates, and forming counterpart grooves or channels in the inside face of each, in such a way that when the two plates are united together a continuous channel or channels is or are formed for the circulation of the steam or heated fluid. The combined plates are riveted or screwed together, and may be made water-tight at their edges by various means; but it is preferred to caulk the edges or to rivet one over the other; or a strip or layer of a compressible or elastic material, such as vulcanized rubber, may be introduced between the plates in a groove near the outer edge, or more or less over the surfaces. By these means a comparatively light and thin plate is obtained, whereby the heat may be applied rapidly and effectively. The improved means for introducing the steam or heated fluid into the plates consists of thin metal tubes attached to each plate by ordinary rigid screw couplings. These tubes are made with coils or bends, and of sufficient length to allow for the entire movement each plate requires, both during the pressing action and during the introduction and removal of the goods, the coils of bends giving the tubes the requisite amount or elasticity.—*Patent abandoned.*

670. J. Johnson. *Improvements in steam boilers.* Dated March 12, 1862.

In carrying out this invention the patentee makes the fire bridge hollow, of any suitable form to suit the flue, and places through the bridge any desired number of horizontal tubes of the multitubular class, and supports the said bridge by a vertical pipe or tube secured firmly to the bottom of the flue by rivets, screws, lock nuts, or other suitable means. When the bridge is under a junction pipe, or when required from any other cause, he connects to the tube at the top of the bridge a cross tube, and places it horizontally or transversely with the flue of the boiler, the said cross tube being secured in any suitable manner. When desired for sake of convenience and portability, he employs a flange joint between the bottom of the bridge and the bottom of the flue. He obtains additional heating surface by placing in the flue a double cylinder of any suitable length, and connecting it to the top and bottom of the flue by pipes or tubes communicating with the water in the boiler. The said double cylinder is made either with or without longitudinal tubes extending through it as may be required. He also places or fixes in the flue a number of tubes in a diagonal position longitudinally, and also cross tubes in connection or separately, for obtaining an increased heating surface and free circulation of water. He also employs a double cylinder, either with or without tubes for heating the feed water to the boiler, which double cylinder he places either in the back part of the flue, or connects it to the exhaust steam pipe, and passes through it the exhaust steam from the engine; the double-cylinder and hollow bridge are formed of welded wrought iron. *Patent completed.*

671. W. Conyers. *Improvements in currying leather.* Dated March 12, 1862.

This invention relates chiefly to rips, calf skins, and shoe hides, and the improvements consist in oiling them after the process of shaving and before the process of scouring, by which the pores of the skins are closed, and the tanning matter is prevented from escaping. Also, after the process of scouring and being hung up to "sam" or dry a little, they are stuffed on the grain side instead of the flesh side, whereby the process of whitening, as it is technically termed, is avoided. *Patent completed.*

672. E. Molyneux. *An improved method of utilizing the waste heat of the products of combustion as they escape from a furnace, and securing a more complete combustion of the fuel.* Dated March 12, 1862.

This invention consists in transferring the waste heat of the products of combustion, as they escape from the furnace to the air, which is supplied to support the combustion of the fuel by forcing (by means of a fan or otherwise) the hot products of combustion, and the air for supporting the combustion to pass alternately through a tube containing metal in a finely-divided state, such as perforated sheets of metal, wire gauze, or coils of wire. The hot products of combustion in traversing the tube are deprived of their heat by the finely-divided metal, and are then allowed to escape. The air for supporting the combustion is then admitted at the end of the tube from which the waste gases escape; as it travels onwards it takes up more or less of the heat that is left in the finely-divided metal, and is finally allowed to pass into the furnace. *Patent abandoned.*

673. P. Gondolo. *A new or improved baking-oven.* Dated March 12, 1862.

In carrying out this invention the patentee heats the oven by means of a metal or other retort, in which he burns coke by preference, combustion taking place by means of the air drawn by the furnace under the bars, and by reverberatory effects of the heating retort. This retort, which forms the furnace, is furnished with metal flues, circulating under the oven, and communicating with an open space surrounding it. The oven consists of a chamber of any suitable form of brick or metal, and completely closed, so as to prevent any products of combustion or heated air from entering, in such manner that the baking of the articles placed therein is effected solely by contact with the heated surfaces and by the radiation of heat. The furnace and its flues should be entirely free of any brickwork, so as to heat as much as possible the air which mixes with the products of combustion dispersing around the oven. The arrangement of the flues may be varied, or they may be entirely dispensed with, their purpose being to distribute in a uniform manner around the oven the heat and products of combustion which escape from the furnace. Dampers are also placed at each side of the furnace for directing the heat upon the sides, or for causing it to pass off at the dome. In order to retain the whole of the heat around the oven, he dispenses with the ordinary chimney, and thus has no draught nor entry of cold air. He, however, applies a small damper in one side of the brickwork surrounding the oven to afford an escape for the carbonic acid gas evolved in the combustion. *Patent completed.*

674. A. M. A'Beckett. *Improvements in railway signal apparatus.* Dated March 12, 1862.

The patentee claims the application of signal apparatus, in which a double cone, or other suitable surface, having patches in black and white, or otherwise in strong contrasts, put in motion by the passage of a locomotive engine and train, as and for the purpose described. *Patent completed.*

675. W. Clark. *Improvements in the manufacture of coloured inks.* (A communication.) Dated March 12, 1862.

This invention relates to improvements in the manufacture of red, blue, green, or violet inks, from pischine or analine. For this purpose the inventor dissolves a certain quantity of analine or pischine, according to the colour of the ink desired to be obtained, in a suitable volume of water. He then brightens the solution by means of alcohol, and thickens it with sugar or gum; the ink is then ready for use. The same bases derived from tar may be transformed by known processes into blue and green colours,

He employs such colours resulting from the transformation of analine for the manufacture of blue or green inks. *Patent abandoned.*

676. F. TOLHAUSEN. *A new toy, which he denominates "the colourimixt top."* (A communication.) Dated March 12, 1862.

This invention consists in so colouring the outer surface of tops that, when set spinning, they shall exhibit a pleasing combination of circular stripes of various colours, hues, and shades. *Patent abandoned.*

677. J. E. GRISSALE. *Improvements in photographic cameras and the mode of fixing the lens therein.* Dated March 12, 1862.

This invention relates to a peculiar construction and arrangement of folding or expanding and contracting cameras. In the improved camera the two ends are connected together on the four sides by an arrangement of the well-known "lazy tongs levers," which, consequently, admits of their being readily drawn nearer to or further from each other, whilst the parallelism of the back and front is preserved. These series of lazy tongs levers are braced together or strengthened by hoops or metal braces, which pass round and enclose them. The whole may be covered by the ordinary bellows covering, or by a bag. In lieu of the methods hitherto adopted for securing the lens tube into the front of the camera, which will allow only of one sized lens being used with one camera, unless a separate front be provided. and in lieu of using the "adapter," the inventor proposes to employ three or more pairs of radial flaps or arms, which are hinged or otherwise jointed at their outer extremities to the front of the camera, one set being placed outside and the other inside thereof. The inner ends of these flaps or arms converge towards the lens tube, and tend to hold it when made to approach each other in its proper central position, two rings on the lens tube, one of which is adjustable by the action of the hood or otherwise, serving as the lateral bearings for the ends of the arms or flaps. By this arrangement it is obvious that different sizes of lenses may be readily fitted into the same camera, the peculiar holding action of the arms or flaps always ensuring the proper central position of the lens. Suitable provision is, of course, made for excluding the light which would otherwise enter the camera when fitted with this arrangement for securing the lens. *Patent abandoned.*

678. E. G. FITTON. *Improvements in machinery for winding yarn or thread on to bobbins or spools.* Dated March 12, 1862.

This invention consists, first, in a novel combination and rrangement of mechanism, whereby the action, which in the ordinary machine drives the single spindle and regulates the winding on and pressing down, as above, of the thread on a single spool or bobbin, is applied to two or more spindles, and the spools or bobbins thereon in the same machine, by which means the operative is enabled to attend simultaneously to the winding on of as many spools or bobbins as there are spindles in the machine, instead of to one only. Secondly, in the application of a spring to each guide or presser used for guiding or pressing down the yarn or thread, whereby the necessity of pressing the guide by hand is obviated. Thirdly, in an arrangement of mechanism, wherein a series of pins, on one or more vertical bar or bars, raised and lowered by levers or other convenient means, act simultaneously on the girders or pressers, so as to lift and hold them up as required. Fourthly, in the application of an eye to the guide or presser, to prevent the yarn or thread flying off, and to increase the drag or friction on the threads in passing to the bobbin or spool. Fifthly, in the application or arrangement of mechanism, wherein a lever, brought into action by the foot of the attendant, moves one or more sliding bar or bars, to which a doffer plate is attached, so as to push the bottoms off the spindles. *Patent abandoned.*

679. W. E. NEWTON. *Improvements in the manufacture of cartridges.* (A communication.) Dated March 12, 1862.

This invention relates to a method of making cartridges with an envelope or covering of collodion instead of paper. In carrying out the invention a mould, composed of two parts, is employed. In this mould is placed the bullet, and on the top of that the powder, which is slightly compressed by means of a plunger introduced into the mould for the purpose. This pressure is applied simply for the purpose of causing the grains of powder to adhere slightly to one another, so that they and the bullet may be removed from the mould in one mass. The charge having been removed from the mould, and in order to make the bullet and powder adhere, a narrow zone or strip of collodion is run round the charge at the point where the bullet touches the powder. When the zone of collodion is hard, the charge or cartridges may be carefully lifted by the bullet, and dipped into liquid collodion of suitable consistence; and when the first coating is dry, the operation may be repeated, and a firm, strong, waterproof covering on the charge will be produced. *Patent abandoned.*

680. J. S. HENDY. *An improvement in the construction of chimneys and chimney-pots.* Dated March 13, 1862.

This invention consists in the construction of chimneys or pots of clay, metal, or other materials suited for chimney-pots, in such a manner as to intercept the downward current of air by the use of internal inclined plates or divisions, in connection with side openings in the chimney-shaft or pots, for the introduction of air deflected upwards in such manner as to assist the inner upward current in repelling the downward current of external air, so that by means thereof the inner upward current may be maintained or assisted, and the downward current may be checked or effectually counteracted. This is effected by introducing into the chimney-shaft or chimney-pot openings in two opposite sides thereof, at the foot or junction of one inclined plate or surface across the chimney or chimney-pot, for turning or deflecting the current of external air entering through the said openings upwards. *Patent abandoned.*

681. F. H. FONTAINE. *A process of reproducing all sorts of photographics, drawings, paintings, and engravings engraved on metal, which he calls "Chalcopantographic."* Dated March 13, 1862.

In reproducing engraved plates by negative stereotypes, the inventor pours upon a zinc plate a solution composed of distilled water, two ounces; gelatine, about one quarter of an ounce; and saturated solution of bichromate of potash, about one fifth of a cubic inch. When dry, he places the gelatinous surface of the plate in contact with the printed side of the negative stereotype on glass or paper of the drawing to be reproduced, exposing it to sun-light about seven minutes, or diffused light about twenty minutes. He then removes the zinc on which the negative stereotype will now be apparent, and immediately places it in a basin of luke-warm water to dissolve the bichromate, and in a few minutes the picture will appear engraved in depth sensible to the touch. He then drains the plate and sponges it with tissue paper; then pours upon the picture or impression a solution of gallic or peragallic acid, and again washes the plate. He now has a stereotype, the hollows or cavities of which are solidified. He takes an impression from this by pouring on the stereotype dissolved and thoroughly-purified gutta percha; and when this is dry, he takes a cake of pure gutta percha (a little larger than the stereotype), which, in its preparation, has been melted with about three times its weight of linseed or other thick drying oil. The surface of this cake is heated by a red-hot iron, and applied on the stereotype in such wise that the coat of purified gutta percha already on the stereotype unites with the cake. He submits the whole to pressure, and permits it to cool. He then removes the pressure, and the solidified stereotype being incompatible with the gutta percha, it follows that he easily detaches from the primitively engraved stereotype a second one in gutta percha, which reproduces the picture or engraving in relief. After having submitted the gutta percha stereotype to the requisite preparations, he places it in a galvanic bath, and thus obtains an engraved copper plate, reproducing the original with exactness, and in such reduced proportions as may be desired. *Patent abandoned.*

682. L. VIDIE. *Improvements in the construction of aneroid barometers, partly applicable to steam gauges.* Dated March 13, 1862.

We cannot here give space to the voluminous details of this invention. *Patent completed.*

683. J. CUNNINGHAM and R. CUNNINGHAM. *An improved ornamental fabric and improvements in weaving and in jacquard apparatus.* Dated March 13, 1862.

The patentees claim the producing of an improved ornamental fabric, and the introducing of improved weaving arrangements for the production of ornamental fabrics, substantially as described; also the contriving of jacquard apparatus, so as, by a mere shift of the draught board or grater relatively to the cords or wires, to cause the pattern to be worked to either side of the fabric, substantially in the manner described. *Patent completed.*

684. J. HUNTER. *Improvements in apparatus for removing slag from furnaces.* Dated March 13, 1862.

This invention is designed to obviate the loss of time hitherto experienced in removing slag from furnaces, and the destructive wear and tear of the boggies or waggons employed therein. In carrying out the invention, according to one modification, the top or platform of the boggie is made hollow or cellular to receive water, by the circulation of which it is kept cool and prevented from becoming distorted and damaged from the heat of the fresh slag. To receive the slag the boggie is placed under a kind of enclosure, the three sides of which consist of cellular or hollow casings, fixed upon pillars or other supports, whilst the fourth side is closed by doors also made cellular or hollow. The slag is run into this box or enclosure, and upon the boggie, and when it is sufficiently cool to retain its shape (this being attained more rapidly than hitherto) the doors are opened, and the boggie is drawn away with the block of slag upon it. To facilitate this removal the enclosure is slightly narrowed from the doors towards the back. Various arrangements may be made for directing the circulation of the water. Two or more water casing enclosures may be fitted up in juxta position, with provision for receiving and filling two or more boggies at one time. *Patent completed.*

685. G. ERMEN. *An improved receptacle or case for the protection of threads of cotton, silk, or other fibrous substances when in a "spooled," "balled," or otherwise wound state, or for the reception of tapes.* Dated March 13, 1862.

This invention relates principally to such threads as are wound upon spools or bobbins, or in the form of balls, or are produced in other convenient forms for use, and generally known as sewing thread, the object being to protect the thread from soiling and entanglement whilst being unwound, and to provide a permanent case for the thread when not in use. For this purpose the patentee employs a case or receptacle subdivided into compartments, each compartment being for the reception of a separate ball, bobbin, or spool, somewhat similar in description to an ordinary work-box, such case being closed by an outer lid or cover. Now, this invention consists in the interposition of an inner lid between the top of the partitions and the outer lid, such inner lid having perforations or slits therein for the passage of the thread or tape, and, consequently, corresponding in number to the number of compartments, so that the inner perforated lid closes the compartments, and the threads project through the perforations; and when not in use the outer cover is placed on, and such ends are protected from withdrawals; or the outer case may be perforated, and the inner one dispensed with; or, if preferred, the threads may pass out of the sides of the case. *Patent completed.*

686. H. FLETCHER. *Improvements in cleaning and preparing cotton, and the machinery used for that purpose.* Dated March 13, 1862.

The Indian Churka is used for separating the seed from the cotton. The inventor furnishes it with a hopper or feeder, and a diaphragm to keep the seed from the cotton. He covers the rollers with metal cylinders, and makes one larger than the other. He applies metal spindles to work in metal bearings, which may be attached to the wood frames. He substitutes weighted levers for the wooden wedges used to gain pressure, or a light metal frame and springs may be used instead of wood. He improves the American roller gin by using rollers covered with metal cylinders, and gains pressure by springs, heavy fly-wheels, or weighted levers. In one form he makes the top roller the largest, and feeds by an aperture at the top, which regulates the quantity of cotton presented to the roller, which draws it to the smaller roller, a cover and grating being used to protect the cotton and part with the seeds. When it passes twice through the roller, he adds a third roller, which may help to straighten the fibres by going faster; or it may have small pins on its surface to draw out the fibres after the seed has been separated, and pass the fibres over a grid, where a blower removes sand and impurities. A series of rollers may be used to clean and straighten the fibres, so that they may not be injured in the packing. The three rollers may be made double acting by having a double feed, the smaller roller acting on each of the larger ones. *Patent abandoned.*

687. J. WADSWORTH. *Improvements in the construction and manufacture of movable and adjustable heels for boots and shoes.* Dated March 13, 1862.

This improved mode of manufacturing movable or adjustable heels for boots and shoes, consists first, in means of stamping and compressing sheet metal in suitable dies, and completing the construction of the metal parts of the same by knurling or milling. Secondly, in the construction of the improved movable heels with a central boss or bearing, in which there is a spring attached to a separate plate. Thirdly, in the employment of wood boiled or steeped in oil in combination with leather, as the material whereof the wearing parts of such movable or adjustable heels are composed. *Patent completed.*

688. J. HOWARD and J. BULLOUGH. *Improvements in warping and beaming machines.* Dated March 13, 1862.

This invention relates to a self-acting stopping motion, that is to say, a means of stopping the warping or beaming machine when one or more of the warp threads break, by by means of a current of electricity. The electric spark or current acts upon a magnet which is in connexion with a catch or knocker-off piece. Each thread of the warp supports, which, when so supported, can only touch one of two conducting surfaces, connected respectively by wires to the negative and positive poles of the battery. The moment a thread breaks, its pin falls on the other conducting surface, and thus forms a connecting link betwixt the two poles. The electric current thus established charges a magnet, which, by attracting a catch or other suitable agent, brings the knocking-off piece into action. The thread being pieced again supports its pin above one of the conducting surfaces, thereby breaking the connexion betwixt the two poles, so that the magnet, having lost its power, cannot attract the agent which brings the knocker-off into action, and so the machine continues working until another thread breaks, and allows a pin to fall, which acts in the manner above described and stops the machine. *Patent abandoned.*

689. E. T. HUGHES. *Improvements in furnaces for consuming smoke.* (A communication.) Dated March 13, 1862.

This invention is not described apart from the drawings. *Patent completed.*

690. S. V. BONNETERRE, C. T. ERHART, and J. F. MONTI. *An improved apparatus for regulating the pressure of steam in steam boilers and the combustion in their furnaces.* Dated March 13, 1862.

The object of this invention is to regulate the pressure of steam in steam boilers, and the combustion in their furnaces, in such manner that they (the pressure and combustion) shall act upon each other, and be thereby mutually regulated one by the other. For this purpose the patentees employ a vessel with flexible sides communicating with the boiler; when the pressure of steam in the boiler increases the vessel expands, and when the pressure becomes reduced the vessel is contracted, and by these actions a valve, damper, or similar mechanical contrivance is closed and opened, thereby reducing or increasing the draft of air to the fire, and regulating the combustion accordingly. *Patent completed.*

PROVISIONAL PROTECTIONS.

Dated May 19, 1862.

1516. T. Morris and R. Weare, Birmingham, electricians, and E. H. C. Monckton, of Fineshade, Northampton, Esquire. Improvements in obtaining and applying light and heat by electricity.

Dated May 23, 1862.

1562. A. Samuelson, 28, Cornhill, engineer and iron ship builder. Improvements in the working of hydrostatic presses, and in the apparatus employed therein.

Dated July 29, 1862.

2154. E. B. Clark, Lower Polgooth, St. Ewe, Cornwall. Improvements in the manufacture of candles, and in apparatus employed therein.

Dated August 7, 1862.

2211. A. Thiriez, Lille, France, manufacturer. A new machine for glossing and glazing all thready fabrics.

Dated August 11, 1862.

2244. J. Lancelott, Birmingham, jeweller. Improvements in the manufacture of ornamental chains for sheet metal.

Dated August 21, 1862.

2339. A. Boubée, Paris. Improved apparatus for casting or moulding glass, and imitating precious stones or marbles.

Dated August 27, 1862.

2371. G. Davies, 1, Searle-street, Lincoln's-inn, civil engineer. A machine for singeing woven fabrics of cotton, wool or silk by means of gas or alcohol. (A communication.)

Dated August 29, 1862.

2401. W. Owen, Rotherham, engineer. Improvements in the manufacture of railway wheels and tyres, and in securing tyres to wheels.

Dated August 30, 1862.

2410. J. H. Johnson, 47, Lincoln's-inn-fields, gentleman. Improvements in coating or covering metallic surfaces with copper. (A communication.)

Dated September 1, 1862.

2412. J. G. N. Alleyne, Butterley Iron Works, Alfreton, Derby, and J. Roberts, 3, Essex-court, Temple, Captain in the Royal Marine Artillery. Improvements in the manufacture of flanged wrought iron or steel plates, and of wrought iron beams and frames of a trough-shaped section, and in the apparatus employed for that purpose.

2418. E. G. Fitton, Ardwick, Lancaster, machinist. Improvements in machinery for winding yarn and thread on to bobbins or spools.

Dated September 2, 1862.

2425. J. Mosheimer, Manchester, chemist. Certain improvements in machinery for amalgamating gold and silver or the ores thereof.

Dated September 4, 1862.

2448. H. L. Emery, Foulis-terrace, Brompton, agricultural implement maker. Improved machinery for ginning cotton.

Dated September 5, 1862.

2462. W. E. Bovill, 22, James-street, Buckingham-gate, civil engineer. An improvement in the mode of applying oil and other fluid lubricating matters to machinery.

Dated September 8, 1862.

2474. J. Whitehead, David-street, Manchester, commission agent. Certain improvements in looms for weaving.

2472. J. Hartshorn, Mansfield-road, Nottingham, lace manufacturer, and W. Redgate, Nottingham, draughtsman. Improvements in means or apparatus for the manufacture of lace fabrics.

2473. C. Fink, Berlin, professor of mechanics. An improved turbine.

2474. G. W. Belding, 7, King-street, Cheapside, Improvements in wringing machines. (A communication.)

Dated September 10, 1862.

2484. J. Saunders, 7, Mordin-place, Lewisham-road, engineer. Improvements in lamps.

2486. M. Smith, Heywood, machine maker. Improvements in machinery for raising the nap on woven fabrics. (A communication.)

2488. F. Hands, gentleman, and H. Holland, Birmingham, black ornament maker. New or improved compositions for the manufacture of black ornaments, such as brooches, bracelets, ear-rings, and other ornaments usually made of jet, which said compositions may also be applied to the manufacture of various other articles.

2490. A. Barclay, Kilmarnock, engineer. Improvements in traction engines, and in apparatus for indicating the pressure of steam.

2492. G. T. Bousfield, Loughborough-park, Brixton. Improvements in machinery used in the manufacture of files. (A communication.)

2494. G. T. Bousfield, Loughborough-park, Brixton. Improvements in machinery for cutting files. (A communication.)

Dated September 11, 1862.

2496. T. Steel, Bradford, York. Improvements in treating soap-suds or other saponaceous or oily matters.

2498. C. R. Humphrey, 69, Old-street, St. Luke's, engineer and machinist. Improvements in printing machinery.

2502. W. Clark, 53, Chancery-lane, engineer. Improvements in cigar and cigarette cases. (A communication.)

2504. J. Thomson, Seafield-works, Dundee, spinner and manufacturer. Improvements in the treatment of vegetable fibres with a view to their manufacture into textile fabrics.

2506. W. Richards, Birmingham, gun manufacturer. Improvements in fire-arms and cartridges.

2508. P. Ward, 2, Cloud's-hill-villas, St. George's, Bristol. Improvements in the manufacture of a double sulphide of calcium and sodium.

2510. A. Whytock, Landsdowne-terrace, Gloucester-road North, Regent's-park, galvanized iron merchant. Improvements in the construction of coated and uncoated sheet-iron boxes, and in the mode of and apparatus for straightening coated and uncoated sheet iron.

Dated September 12, 1862.

2516. J. Rowell, Aberdeen, manufacturer. Improvements in pillars and apparatus for straining wire.

2518. A. J. Moreau, Sherborne-street, Blandford-square, chemist. An improved mode or process for reducing or melting pulverized metals or metallic ores.

Dated September 13, 1862.

2522. H. J. Lewis, Birmingham, engineer. Improvements in engines to be worked by means of water.

2524. W. J. Williams, Arundel-street, Strand, merchant. Improved apparatus or machinery for punching, cutting, or pressing metal or other plates or substances, which said improvements are also applicable to tension rods.

2526. A. V. Newton, 66, Chancery-lane, mechanical draughtsman. An improved mode of and apparatus for sleeking, creasing, and raising leather. (A communication.)

2528. W. Palmer, Sutton-street, Clerkenwell. Improvements in lamps and in apparatus used therewith.

Dated September 15, 1862.

2530. W. G. Rawbone, Birmingham, gun manufacturer. Improvements in gun barrels, and in machinery to be employed in effecting the said improvements, and in tools and machinery for producing inscriptions, ornaments, and devices upon gun barrels, lock plates, and other metallic parts of small arms, and for producing inscriptions upon saws and articles of cutlery generally.

2532. E. Balmforth, Albion Mill, Batley, York, millwright and machine maker. Improvements in machinery employed in finishing texile fabrics, commonly called "raising gigs."

2534. H. M. Radloff, Limehouse, oil refiner. An improvement in vessels for filtering oils.

Dated September 16, 1862.

2538. B. F. Weatherdon, Kingston-upon-Thames, civil engineer, and E. H. C. Monckton, Fineshade Abbey, Northampton. A new or improved engine for obtaining and applying motive power.

2544. R. Lakin, Ardwick, machinist. Improvements in the mode of plating or shielding ships of war.

2546. C. E. Guye, Fleurin, canton Neuchatel, Switzerland, watch maker. Improvements in apparatus for cutting and finishing the teeth of wheels. (A communication.)

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

1472. J. Wright. Improvements in machinery for digging, excavating, and removing earth. (A communication.)

1483. C. Binks. Apparatus for treating linseed.

1493. B. Sharp. Construction of ships and vessels.

1496. C. Binks. Obtaining oxygen and chlorine gases.

1500. J. Hogg, jun. Book covers.

1508. J. Wright. Sheathing iron or metal ships.

1509. J. Eastwood. Machinery or apparatus for removing and wringing hanks of thread.

1510. R. Ramsden. Machinery or apparatus for mashing malt.

1515. T. Morris, R. Weare, and E. H. C. Monckton. Protection of life and property.

1516. T. Morris, R. Weare, and E. H. C. Monckton. Obtaining and applying light and heat by electricity.

1517. M. A. F. Mennons. Breech-loading fire-arms. (A communication.)

1523. J. Taylor. Abstracting heat from liquids.

1530. J. Hopkinson. Pianofortes.

1535. A. Giles. Constructing floating breakwaters.

1539. J. Oxley. Making wheels.

1540. C. W. Siemens. Electric telegraph apparatus.

1542. E. De la Bastida. Production of designs. (A communication.)

1543. G. Crawford. Musical instruments.

1544. J. Needham. Breech-loading fire-arms.

1550. H. Cook. Electric batteries. (A communication.)

1551. W. Roberts, and T. Greenacre. Cocks or valves.

1554. P. McGregor. Spinning and doubling fibrous substances.

1557. W. E. Wiley. Penholders.

1560. E. Mouline. Apparatus used in weaving.

1562. A. Samuelson. Hydrostatic presses.

1563. W. Clark. Manufacture of socks and stockings. (A communication.)

1565. J. Harrison, and R. Parkinson. Rollers for preparing, spinning, doubling, sizing, winding, warping, and weaving.

1566. W. and J. Harrison, J. Oddie, and W. Parkinson. Machinery for winding, sizing, and weaving.

1569. M. Walls, and J. Crompton. Railway signals.

1570. J. Taylor. Preparing fibrous materials to be spun.

1572. W. Clark. Manufacture of buttons. (A communication.)

1574. J. A. C. N. Delpech. Pumps.

1584. J. Halliday. Manufacture of ornamental trimmings.

1585. J. Ireland. Moulds for card cylinders.

1609. J. A. Ransome. Manufacture and fastening railway chairs with wood treenails.

1614. G. Ashton. Dying fibrous substances.

1616. W. Perks. Metallic sash bars for windows, skylights.

1643. R. Shortrede. Presses for pressing cotton and other articles.

1655. J. King. Looms.

1677. A H. Perry. Fastening together or securing railway chairs and sleepers.

1707. W. R. Jeune. Manufacture of fabrics.

1719. J. M. Ryo-Catteau. Twisting fibrous threads.

1738. W. Holland. Carding engines.

1753. B. George. Construction of portable beds, bolsters, pillows, and sofa and other cushions.

1801. W. E. Newton. Electrical brushes. (A communication.)

1810. M. Wiggell. Bolts and fastenings for shipbuilding.

1955. J. Kidd. Gas meters.

1975. J. Rhodes. Rag machines. (A communication.)

2062. A. Cotelle. Manufacture of alcohol.

2121. T. Sagar, and J. Roeliff. Moulding.

2154. E. B. Clark. Manufacture of candles.

2215. R. A. Brooman. Covering ships with a backing of wood. (A communication.)

2412. J. G. N. Alleyne, and J. Roberts. Manufacture of flanged wrought iron or steel plates.

2426. W. Hunt. Manufacture of muriate of ammonia.

2431. J. B. Thomson. Electro-magnetic machines.

2445. B. F. Cowan. Cannon and other fire-arms.

2492. G. T. Bousfield. Manufacture of files. (A communication.)

2494. G. T. Bousfield. Cutting files. (A communication.)

2506. W. Richards. Fire-arms and cartridges.

2526. A. V. Newton. Apparatus for sleeking, creasing, and raising leather. (A communication.)

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2202. C. Stevens.
2188. P. J. L. Chaumont.
2184. C. Cowper.
2221. J. H. Johnson.
2249. J. Rawlings.
2204. T. Allan.
2235. E. Morewood.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2129. J. Beattie.
2168. J. Good.
2175. J. Beattie.

LIST OF SEALED PATENTS.

Sealed September 25, 1862.

847. F. Tolhausen.
848. R. Edwards.
852. J. L. H. C. C. de V. de Corneillan.
854. R. de Bary.
860. G. H. Birkbeck.
864. W. B. Nation.
865. R. A. Owen.
869. E. Smith.
872. J. Boucher.
873. Y. Parfrey.
883. E. B. Hart.
884. J. Platt, and W. Richardson.
889. R. Young.
891. W. Tyler.
892. W. H. Hook.
894. W. B. Lord, and F. H. Gilbart.
897. R. C. Ransome.
901. J. M. Clements.
906. P. R. Guchoud.
907. C. P. Gontard.
911. W. Turner.
917. E. Hartley, G. Little, and J. Hinchcliffe.
919. H. J. Madge.
920. J. Platt, and W. Richardson.
924. Rev. G. Scratton.
925. S. Warren.
930. B. Blackburn.
931. S. Hunter.
932. T. Moore.
935. W. Leopard.
937. G. Rebour.
938. W. Helme.
939. R. Morton.
940. G. Bower, and J. Qualter.
942. G. Hunter.
943. R. M. Toogood, and J. Laybourne.
944. W. Kemp, and T. Cowley.
946. D. Wilson, and E. A. Cowper.
948. A. Mann.
949. W. A. Richards.
951. J. F. Woodall.
955. F. C. Bakewell.
979. B. Thompson.
983. A. Harris.
1008. S. Farron.
1019. R. Theyson.
1029. L. Christoph, W. Hawksworth, and G. P. Harding.
1031. J. Platt, W. Richardson, and W. Holland.
1032. J. Petrie.
1051. J. H. Johnson.
1061. J. Park.
1098. W. F. Lock.
1104. F. P. Warren.
1111. J. Ashbury.
1127. C. D. Abel.
1155. S. P. Matthews.
1208. G. Richards.
1218. A. C. Kirk.
1294. T. F. Griffiths.
1601. J. F. Harrison.
1612. P. Boisset, and B.
2161. H. White.
1795. G. Haseltine.
1767. J. Lancelott.
1668. J. J. H. Gebhardt. Antognini.

LIST OF SPECIFICATIONS PUBLISHED

For the Week ending September 27, 1862.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s. d.		s. d.		s. d.		s. d.		s. d.		s. d.
427	0 4	438	0 6	449	0 6	459	0 10	469	0 4	479	1 8
428	0 8	439	0 6	450	1 4	460	0 8	470	0 8	480	0 6
429	0 4	440	0 10	451	0 4	461	1 0	471	0 4	481	0 4
430	0 4	441	1 0	452	0 4	462	0 4	472	1 4	482	1 4
431	0 4	442	0 4	453	0 4	463	0 6	473	0 6	483	0 10
432	0 4	443	0 4	454	0 4	464	0 8	474	0 8	484	0 10
433	0 4	444	0 8	455	0 4	465	0 8	475	1 0	485	0 8
434	0 8	445	0 10	456	0 4	466	0 4	476	0 4	486	0 4
435	0 10	446	0 4	457	0 8	467	0 4	477	0 4	487	0 4
436	1 0	447	0 8	458	0 4	468	0 4	478	0 8	488	1 2
437	0 4	448	0 10								

Note.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

Errata.—In our notice last week of "Iron Manufacture," the word "hæmatite" was unfortunately misprinted, "hexmatite" on each occasion of its occurrence; "magnitu" was substituted for "magnetic," and one or two other minor typographical errors also inadvertently showed themselves.

TO CORRESPONDENTS.

Received—T. F. Y., R. L., S. P., W. A., Viator. "Viator" in our next. Fluid resistance in our next. St. J. V. D. in our next. W. P., R. H. D., J. H., W. W., Capt. P., W. H. S., D. M.

A trial is ordered by the Admiralty to be made at Portsmouth of a stern rudder constructed on the patented plan of a Mr. Lumley. The peculiarity of the rudder consists in its being cut in two vertically, and the two parts being connected together by gudgeons and pintles in a manner precisely similar to the ordinary method of hanging a rudder to a ship's sternpost. At the outer part of the rudder's afterpiece are attached two chains, which pass through the main piece of the rudder, one on each side. The result of this arrangement is that on the rudder being moved over, either to starboard or port, the chain becomes taut, and brings the outer piece of the rudder over at a sharper angle than the main piece, and thus presents a hollow surface to and obtains a greater hold on the water than can be obtained with the ordinary rudder, and without bringing any very great strain to bear upon the gudgeons and pintles.

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, OCTOBER 10, 1862.

PLATE-WORKING MACHINERY AT THE INTERNATIONAL EXHIBITION.

GIVING our foreign guests precedence, from international courtesy, we find that M. Tussaud, of Paris, shows a small shearing machine, with revolving cutters, for plate up to 4 inches thick. This, we believe, has been patented in England. The gearing in this machine is carried out, away from the cutters, which are, by extending their spindles, left free at the back, thereby allowing of a great breadth of plate to be cut. There would be no limit to this breadth if the cutters were worked by bevil-gearing. This appears a very ingenious way of getting over the difficulty found in most shearing machines, of taking in a great breadth of plate. It is, no doubt, a good plan if the machine be used for straight shearing merely, but its efficiency is diminished for cutting out curves or circles, as the frame carrying the cutters necessarily blocks up one side of them. The workmanship is very inferior. The Americans seem too busy at punching and shearing themselves to send any machine of the kind to the Exhibition.

Austria exhibits two small hand-lever shears, and a punching machine with six quarter-inch punches for 3-16 plate,—neither of these deserving but little notice. Horak, of Vienna, shows a little machine for punching out coffee strainers, for which he obtained a medal. It consists of four small punches, worked up and down in a frame, while the plates are being rotated underneath by a self-acting motion. The centre hole to fix the strainer down is first made by hand.

Spain sends a small double punching machine, Mr. De Bergue, of Barcelona, being the exhibitor. It appears as a "pressing machine" in the Official Catalogue. It is on the well-known model of the Manchester machine by the same firm, but seems to be disowned by the English branch on account of its rude workmanship. This is the only machine sent by Spain.

Messrs. Whitworth, and Messrs. Sharp, Stewart and Co., of Manchester, and Messrs. Buckton, of Leeds, show large punching and shearing machines, direct acting, with eccentric and slides. In Whitworth's machine for punching holes in 1¼-inch plate, and shearing up to the same thickness, taking in 18½ inches, the power is got up by a single large wheel, so that all the strain is on one tooth. The framing is cast in two pieces, and, to fully carry out the "dualistic" principle, he has two fly-wheels. The stroke of the punch can be varied—a very useless addition. The stop motion for the punch is very defective, as it requires several turns of a handwheel to throw the punch out of gear, and this wheel, again, is out of reach of the man using the punch. It is easily seen that Mr. Whitworth does not make steam boilers in his workshops.

Sharp, Stewart, & Co.'s machine for punching and shearing 1¼-in. plates is well shaped, and is in every respect much superior to Mr. Whitworth's. The shears are at an angle for bar cutting. It does not, however, seem very convenient for working angle iron.

The machine of Messrs. Buckton punches 1¼-in. holes in 1¼-in. plates, and shears up to the same thickness, taking in 24 in. from the centre of the punch and edge of the shears. These are at an angle for cutting bar iron, and there is, besides, a knee joint arrangement for cutting up to 6-in. angle iron. The machine is well arranged for punching and shearing angle iron. The framing is in one rather rough casting. The lower blade of the shears is lengthened out to bear up the plate conveniently.

Nasmyth & Co., of Patricroft, show a self-acting dividing and punching machine for hole in any length of plate up to 10 feet 9 in. The plate to be punched is placed upon a table similar to that of a planing machine, and is worked underneath the punch by a very ingenious self-acting motion, which can be easily altered to suit a different pitch of rivets. The eccentric working the slide of the punch is driven by an independent engine, of the Patricroft steam-hammer design, at the back of the machine.

Fairbairn & Co., of Leeds, show a small portable shearing machine, on rollers, for either hand or steam power, with circular cutters, shearing up to ⅝-in. plates, with a stud in a grooved table for cutting circles. This will only take in 7 in. from the edge of cutters.

Hulse, of Manchester, has a neat small punching and shearing machine, on rollers, to punch a ⅝-in. hole, shearing a ½-in. plate, and taking in 9½ in. It has the usual fault with machines having the punching and shearing on the same side—that of the shears being too high for the convenience of the operative.

Hunt, of London, has a very elegant hand machine for punching and shearing 5-16 in. This little machine is very well arranged, but it might be improved by placing the shears at an angle.

Rhodes, of Wakefield, exhibits a small punching and shearing machine, for plate ⅝ in. thick, and taking in up to 8 in. Its slides are worked by two levers, the ends of which are caught at the top by a separate eccentric and catch to each. Much gearing is thus dispensed with—a great gain in any machine, and especially so in this particular kind of machine tool, as shreds of the plate being cut are so liable to get into the wheels and break the teeth. The shears are at an angle for bar cutting. This machine seems to contain within itself the elements of a good punching and shearing apparatus. The general idea might be carried out in a larger-sized machine; and, worked by two cams instead of the present eccentrics, would give the irregular motion of the punch so much liked by boiler-makers, as they thereby have time given them to set the plate properly under the descending punch. A stop motion to throw the punch out of gear is then not so much required.

De Bergue and Co., of Manchester, exhibit two punching and shearing machines. The large size one is driven by a small steam engine attached to its framing. The ordinary slides are dispensed with in these machines, as it is worked by a triangular lever, somewhat similar to the so-called "T bobs," for large mining pumps. This triangular lever is caused to vibrate at the top by an eccentric in a slide, and it punches and shears at the other two corners of the triangle, vibrating on a bearing between these two. The larger machine has a very elegant and symmetrical appearance. The punches are fitted with a small nipple on the face, which in the process of punching fits into a centre punch mark in the plate to be punched. When punching holes in a straight line at a uniform pitch, a pointer is attached to the machine, so adjusted that the distance of its point from the centre of the punch equals the pitch of the holes to be punched. This pointer, in the process of punching, drops into the centre punch indentations, indicating to the workman that the adjoining indentation is exactly under the centre of the punch. By means of this apparatus, in addition to greater accuracy, more work is got through. As many as 16 holes a minute can be punched by this machine. It is capable of punching 1¼-in. holes through 1¼-in. plates 21 inches from the edge, or discs 7 in. diameter through ¾-in. plates. The machine admits of the punching-head being reversed, if it be required to punch holes in large plates, at a greater distance from the edge. The punching-head and die-holder may also be taken away, and replaced by apparatus for rivet making. The second size machine is similar in principle, but slightly different in design. It is single-geared only. It is fitted with stop motion and pointer similar to the large punch above-mentioned. This stop motion is instantaneous, and very convenient to the workman, a mere touch of the handle being all that is required to throw the punch loose, and out of gear. The fact of the punch in this machine moving through an arc of a circle is not such a disadvantage as it would at first appear; because, as most people will have observed, the punching of any plate is in reality effected long before the punch is down; the sharp snap of the driven-out disc of metal is often heard before the punch is half through.

Messrs. De Bergue also exhibit a riveting machine for girder work, driven by a belt, the motion being transmitted through double gear to an eccentric shaft, which alternately forces forward and draws back, by means of a connecting rod, a hollow cylindrical carrier, holding a plunger, in which is fixed the heading die. The opposite die is held in the end of a strong steel screw, fitted into a bush in the pillar which receives the thrust in the process of riveting, the use of the screw, which is squared at the outer end, being to adjust the distance between the dies for various thicknesses of plate. This machine is also fitted with a stop motion similar in principle to the one on the punching machine, by means of which it is protected from injury should the plunger, in advancing, come in contact, by accident, with a cold rivet, the edge of an angle bar, or other impediment sufficient, in case no provision were made for such a contingency, to break down the machine.

This machine is capable of heading rivets up to 1 inch in diameter, and at the rate of about 16 per minute, and, including all stoppages, its average has been from 3,500 to 5,000 rivets per day of ten working hours. This, compared with the old system of handwork, is equivalent to from 17 to 25 sets of riveters, each set comprising three men and a boy.

The angle bar, cutting, or scrap-cutting machine, also exhibited by this firm, is similar in principle, so far as the eccentric and large punching gear are concerned, to the shearing machines. It is also a very fine looking machine, and is capable of cutting bars 6 inches by 1¼ inches in thickness.

It is to be regretted that a connected series of boiler-making machinery is not in the Exhibition. Plate-bending machines are not at all represented. A good, simple machine of this kind for flues, chimney-plates, &c., is rather a desideratum.

Engineers are now pretty well agreed amongst themselves that perforating plates by punching very much weakens them. Anyone can see that such a process must very much "punish" a plate. It is possible that in the International Exhibition of 1872 there may be no boiler-plate punching machines, as engineer's customers may have learnt by that time to specify drilled rivet holes.

PHILOSOPHICAL AND MATHEMATICAL INSTRUMENTS AT THE INTERNATIONAL EXHIBITION.

We last week took occasion to remark upon the display of horological instruments in the north-east gallery of the Exhibition, and as being nearly allied to them in character, and located in the same part of the building, we intend devoting some attention this week to the show of philosophical and mathematical apparatus. It is almost unnecessary to say that during the last few years immense improvements have been made in this particular branch of mechanical science. Those who were fortunate enough to see the Exhibition of 1851, and who took any interest at all in the philosophical instrument department of it, cannot fail to remark, while examining the present display, the great advancement which, during the intervening eleven years, has been effected. The comparison is, indeed, fraught with the most gratifying sensations, for while we know that scientific discovery in this country has progressed with wondrous rapidity during the period named, we see also that mechanical skill and industry have more than kept pace with it, and supplied in abundance the necessary adjuncts and aids for pushing discovery still further. Assuredly, therefore, no apology is needed on behalf of the representatives in the International Exhibition of the philosophical and mathematical instrument branches of the mechanical trades of the United Kingdom. Their works speak for themselves, and eloquently tell also of the thought, ingenuity, and skill of those who contrived and manufactured them. Indeed, the universal excellence of the various scientific contrivances of the description under notice, renders the task of selecting individual ones for especial comment arduous and difficult. We must beg of those exhibitors, therefore, who may fail to obtain "honourable mention" at our hands, to attribute the fact, not to want of will or discernment, but to the physical impossibility of doing justice to all claimants.

As being in these stirring times, when other nations are striving for maritime superiority, and an increased knowledge of nautical science of most immediate interest to our readers, we shall first speak of such appliances as have reference to oceanic discovery. Foremost among these are the instruments invented by Mr. Henry Johnson, of 39, Crutched-friars, and manufactured by Mr. Hoffman, of Wilmington-square, Clerkenwell. They consist of deep-sea pressure gauges, and deep-sea thermometers. It has been long known from actual experiment, confirmatory however of scientific theory, that in deep-sea soundings the pressure of water is too great to admit of accurate measurement, by the compression of any elastic fluid confined in a small portable instrument. For a long time water was considered incompressible, but, as shown clearly by Mr. Glaisher, F.R.S., in a paper read by him before the British Association, it has been found to possess a slight degree of elasticity, sufficient, indeed, to render its compression available as an indication of the density of the water into which it is lowered. Without going into detail, as to the various efforts which have been made during the last half century to produce efficient instruments for the purpose of measuring the density of the ocean at great depths, it may be stated that most of them had, up to the time of the inventions of Johnson's pressure-gauge, proved complete failures. In experiments made with metal pressure-gauges, it was found, for example, that air bubbles adhered to their inner surfaces, and materially interfered with the results.

The deep-sea pressure-gauge of Mr. Johnson consists of a cylindrical glass vessel with a long neck, or stem, finely graduated. The material used in this case, therefore, allows of an inspection of the interior, and the absence of air bubbles may thus be assured before any experiment is made with it. It would be difficult, without diagrams, to describe exactly the construction of the apparatus. It must suffice to say that it appears to be admirably adapted for the effecting the object sought, and that the probability of its derangement when in use is small indeed. The deep-sea thermometer of the same exhibitor is intended to be employed in conjunction with the gauges. It is composed of solid metals of considerable specific gravity—namely, brass and steel. They are, therefore, not liable to compression by water, which, under a pressure of 1,120 atmospheres, or at a depth of 5,000 fathoms, in round numbers, acquires a density of specific gravity of 1·06 only. In the construction of this instrument advantage has been ingeniously taken of the well-known differences in the ratios of expansion and contraction by heat and cold of the two metals named. Compound bars formed of these slips of brass and steel are riveted together, and this bar is found to assume a slight curve in one direction, when heat has expanded the brass more than the steel, and a slight one in the contrary direction, when cold has contracted the brass more than the steel. These changes are registered by the instrument itself, and in testing one for six months by standard meteorological instruments, Mr. Glaisher found that the readings of the deep-sea thermometer approximated closely to those of the standards used. It is needless to expatiate on the value of such contrivances as those of Mr. Johnson. All naval officers will at once recognize it, and the Admiralty no doubt are cognizant of the importance of the inventions—at least they should be so.

The Submarine Telegraph Company exhibit samples of their various continental submarine cables, which are in working order. These samples are of different sizes, and represent in the aggregate a submarine conductor of 2,777 miles in length. It is not necessary to describe the peculiar formation of each cable, because our own readers are probably for the most part quite conversant with the general formation of submarine conductors. We need not urge either a consideration of the progress made in submarine telegraphy since the year 1851, because our own pages have continuously recorded that progress, and shown alike the strong and the weak points of the science. Messrs. Yeates and Sons, of 2, Grafton-street, Dublin, exhibit largely and successfully, and their works comprise astronomical, meteorological, philosophical, and mathematical instruments. Two equatorially-mounted telescopes, supported by iron columns, are perhaps the most remarkable portions of the display made by this firm, as they certainly are the most conspicuous. The mounting possesses many improvements in detail. The clamping circles are quite independent of the divided circle, and are placed at the opposite ends of their respective axes. The clamping circle of the polar axis is directly under the northern pivot, and that of the declination axis close to the telescope. The clamping arrangement also differs from that in general use at present, as being far more effective and free from torsion. The smaller stand of the two appears to be well adapted for those who have no convenient space to erect an observatory upon. The iron column, for example, may be permanently fixed in the open air, whilst the equatorial arrangement packs compactly in a small box, from which it may be lifted into its place on the top of the column in a few minutes, without its adjustments being materially affected.

The Elliptograph of Messrs. Yeates & Sons is another instrument whose name implies its use. This differs in three essential points, however, from all other elliptographs in use. Firstly, there is no limit whatever to the variation in the proportions of the ellipses formed by it. Secondly, it offers great facility for setting it to draw any ellipse whose major and minor axes are known; and, thirdly, it gives more accuracy to the figures formed by it in all proportions—at least, so say its inventors. Of its ingenuity of construction, at any rate, there can be no doubt. The large public barometer exhibited by this firm, the dial of which is three feet in diameter, and their public thermometer, with a dial of the same dimensions, are remarkable illustrations of the willingness of Messrs. Yeates and Sons to meet the wants of the present day. In agricultural districts and fishing towns it is easy to comprehend that such instruments would be especially useful, and indeed vitally important, to the inhabitants.

Telegraphic implements or apparatus are, we need not say, presented to our notice at every point in what may be called, for the sake of brevity, the philosophical instrument court. But as in former papers on the Exhibition much attention has been devoted to the electric telegraph and its accessories, we omit purposely further mention of them at present.

Of optical instruments of various kinds, but principally microscopic, Mr. Pillischer, of 88, New Bond-street, exhibits largely, and most successfully. Indeed, every kind of instrument of this nature is to be found in the stand of Mr. Pillischer, in the north-east gallery. A very elegant reading lamp, among other exquisite works of this maker, deserves mention. It appears to be admirably adapted for those whose avocations or whose tastes induce them to write or read by artificial light. Much artistic taste has been displayed in the design of one particular pattern of lamp which came under our notice, and we are informed that this combines economy in action with beauty of appearance. The commonest colza oil need only be used, while the light emitted is of the whitest and steadiest description.

Perhaps a reading lamp may be thought scarcely to fall legitimately under the term philosophical instrument. A good one in all respects is, however, a desideratum in this northern latitude of ours, both to the philosopher and the man of science; and, now that the days shorten and the nights grow proportionately long, the importance of such an apparatus is more and more likely to be appreciated. The high testimony in favour of Mr. Pillischer's reading and microscopic lamp renders further apology for introducing its name into this paper unnecessary, and we commend it heartily to the notice of our readers.

Ross, of 2 and 3, Featherstone-buildings, Holborn, has an excellent show of optical instruments, microscopes, telescopes, photographic lenses, &c., and among them a large compound microscope, with Wenham's binocular arrangement, may be noted as one of the most remarkable. It appears to combine all the recent improvements in this class of instruments, with excellence of workmanship and compactness of form. The distinguishing features of it are a concentric rotating stage, having one inch of motion in rectangular

directions, with rack and very fine-threaded screw movements to the optical part. The clamping it such as to admit of the adjustment of the apparatus to any required angle of inclination, and a secondary stage allows of the holding and adjusting by universal motions all the illuminating and polarizing apparatus below the object under examination. Flat and concave mirrors, diaphragm plate, &c., go to make the appliance in all respects complete. The whole may be neatly packed in a mahogany case when not in use. Many other specimens of compound and simple microscopes are to be seen in Mr. Ross's collection, with separate parts of the instrument detached and in detail. Of telescopes, too, there is an admirable variety, both as regards size and power.

Suffell, of 132, Long-acre, well known in the scientific and mechanical world for the excellence of his mathematical and drawing instruments, and for the general exactitude of his theodolites, displays some of the choicest results of his labours in all these branches, and evidently deserves the fame he has attained for their manufacture. Not less praiseworthy in their way are the rules, scales, levels, &c., for mechanical, scientific, and agricultural purposes shown by James Tree and Co., 22, Charlotte-street, Blackfriars-road. Practical mechanics have long since admitted the care and attention which this firm has devoted to the manufacture of those simple instruments which are hourly required in the processes in which they are engaged, and which enable them to turn out their work with that precision which is so essential in the mechanical arts. It is with pleasure, therefore, that we direct attention to the "exhibits" of Messrs. Tree and Co.

Perhaps one of the most valuable contributions in the way of theodolites to the show of mathematical, philosophical, and scientific instruments in the north-east gallery, is that known as Metford's, but which is manufactured by Pastorelli and Co., 208, Piccadilly, and 4, Cross-street, Hatton-garden. This splendid instrument appears to have had lavished upon it all the ingenuity and niceness of workmanship of which such a contrivance is susceptible. It would absorb far too much of our space to enter minutely into the peculiarities which distinguish Metford's traversing theodilite, but we are certain that railway and ordinary surveyors should only examine it for themselves to be assured of its admirable adaptation to the various kinds of work for which it is intended. No practical point has apparently been overlooked in its construction, and whilst it is of an elaborate character, it is apparently not likely soon to get out of order—and it is moderate in price. The "Improved Level," exhibited by Pastorelli and Co., is not less excellent in its form and fittings. In the way of drawing instruments, barometers, thermometers, and a great variety of appliances to meet the requirements of men of science engaged in whatever branch they may be, the same firm is well represented at the International Exhibition. Bailey, 162, Fenchurch-street, has a considerable display of sextants of different kinds, as well as artificial horizons, prismatic and universal compasses, &c., which all speak in favour of his capabilities for executing such work. Spencer, Browning and Co., of the Minories, in the manufacture of instruments and appliances of a similar character, are not unknown to fame. In fact, they enjoy a long-established celebrity, for their construction of nautical instruments especially, and, as may be imagined, they have succeeded in justifying their claim to that celebrity by their demonstration at South Kensington.

A rather curious collection is that of Braham, of Bristol, in which spectacles of every sort, from the earliest dates to the present time, are to be found, thus showing the improvements effected in those useful articles. The latest inventions in this department of optical science have rather extraordinary names given to them—names which in the pre-scientific age of our great grandfathers and grandmothers would have rather puzzled those venerated individuals to pronounce, or to understand the meaning of if they did succeed in pronouncing them correctly. Take for example, Braham's "pantoscopic, and anti-opthalmioscopic spectacles, spherical eye-preservers, and helical spring eye-glasses." No doubt these are very excellent aids to those who are plagued by weak or defective vision, but we cannot see why simpler titles might not have been given them.

Casartelli, of Market-street, Manchester, cuts a respectable figure in the department of microscopes, telescopes, and mining and surveying instruments, as he does also in regard to steam-engine indicators, vacuum gauges, and steam pressure-gauges. A portable anemometer, invented by J. Dickenson, Esq., government inspector of mines, and manufactured by Casartelli, is an ingeniously contrived instrument for showing the velocity of air current in coal mines, and by means of which may readily be computed the quantity of air, in cubic feet, passing per minute through the air ways. No doubt this instrument might readily be adopted to other purposes than that for which it is especially intended, and at any rate it is as we have said ingeniously designed.

Some admirable and instructively-arranged specimens of glass for optical purposes are deposited in the gallery by Cutts, Sutton and Son, opticians to her Majesty, 43, Division-street, Sheffield. These consist of coloured and white crown glass, plate glass, achromatic flint glass, crown and flint discs used in the construction of the best quality of achromatic object glasses for telescopes, &c. In fact, glasses and pebbles of every quality and kind used in the construction of optical instruments, and in their various stages of progress, from the rough to the finished lense, are here to be seen, and from them a good idea may be formed of the amount of labour exerted in bringing them to the proportion in which they are found in well-made microscopes and telescopes.

In the manufacture of bullion, chemical and assay balances, which is a branch of business connected very closely indeed with philosophical and mathematical instrument making, and constantly requiring the most delicate manipulation, Messrs. Ladd and Oertling, of 192, Bishopsgate-street Without, are honourably known. In the Exhibition several specimens of their workmanship are shown. The peculiarity of their balances, and which has been pirated by some unscrupulous scale-makers without acknowledgment, is that they are all, whether large or small, constructed on the principle of three edges working against three planes. Not only does the fulcrum rest upon a plane, but the pans also are suspended by inverted planes upon knife edges affixed to the ends of the beam. The advantages gained by this system are twofold; first, it admits of the balance being adjusted to the greatest point of sensibility without diminishing its precision and constancy, and, secondly, when the balance is not in actual use the pans rest upon supports entirely independent of the beam.

These balances are used extensively at Her Majesty's Exchequer, at the Royal Mint, at the Bank of England, and other public establishments, and in all, we have reason to know, are highly approved.

The instruments exhibited by Negretti and Zambra, of Cornhill, Hatton-garden, and Regent-street, embrace specimens of almost all the varieties which have been enumerated in this notice, and certainly if the public be not aware of the excellence of most of them, it is not the fault of the public press. The publicity already given to the works of this firm, indeed, renders it unnecessary for us to expatiate further upon them.

An indicator for solving nautical and astronomical problems occurring in navigation, with sufficient accuracy for nautical purposes, is an ingenious contrivance exhibited by Charles Moore, Quay-parade, Swansea. The deviation of the compass by local attraction is also discoverable by its aid, and we are told that its action is not influenced by climate.

Immeasurable indeed are the beautiful and highly useful inventions exhibited in class XIII., they are the tangible reflex, so to speak, of the glorious brain and hand-labour of the philosophical and mathematical instrument makers of the United Kingdom, and they are also of a character to demonstrate to the world the perfection we have attained in this branch of art, and the superiority we mean in the future to maintain. We leave this department of the Exhibition now, not because we are inclined to do so, but because inexorable "space" says we *must*.

THE IRON MANUFACTURE OF GREAT BRITAIN.*

(Continued from page 189.)

It will be remembered that in our former paper upon the above subject we were compelled to come to a somewhat abrupt conclusion at the very point where its consideration became especially instructive and important. Gladly, therefore, is the opportunity taken of pursuing the iron manufacture of Great Britain, as exemplified in the work of Messrs. Truran, Phillips, and Dorman. The quality and quantity of metal produced are, after all, the vital points upon which depend everything that is connected with the iron trade of this country. The authors of the book under notice appear to have been acutely sensible of this fact, and a very considerable portion of it is devoted accordingly to the "produce and "quality of metal." They give statistics of the rate of production at many of the most considerable works throughout the kingdom, and deduce therefrom practical rules which may serve for the guidance of those who are endeavouring to arrive at the highest state of efficiency in the management of their own. It is stated in the volume on iron manufacture that "the foundry iron furnace at the Dowlais "works is of 275 cubic yards capacity, and is "blown with a blast of 5,390 cubic feet of air "per minute. The materials charged at the "top, in addition to fuel, consist of calcined "argillaceous ore, coal, and limestone. The "yield, or consumption, averages 48 cwts. of "calcined ore, 50 cwts. of coal, and 17 cwts. "of broken limestone for every 20 cwt. of "crude iron obtained. The weekly make of "iron is occasionally over 130 tons, but we "may assume this as sufficiently high for our "calculations. The produce of cinder weekly "amounts to nearly 250 tons. The weekly "consumption of solid material at top will be

* Sketch of the Mode of Manufacturing Gunpowder at the Ishapore Mills, in Bengal, with a record of the Experiments carried on to ascertain the value of charge, windage, vent and weight, &c., in mortars and muskets; also Reports on the various Proofs of Powder, by Colonel William Anderson, C.B., late Agent at Ishapore, with Notes and Additions by Lieutenant-Colonel Parlby, Retired Bengal Artillery. Weale. London: 1862.

"as follows:—calcined ore 312 tons, coal 325 "tons, limestone 110 tons 10 cwt., total 747 "tons 10 cwt. By measurement, these ma- "terials in a mass would occupy 1,066 cubic "yards.

"The air delivered by the tuyeres weekly "weighs 1,695 tons, and measures 50,550,400 "cubic feet. From these quantities we "obtain the following ratios, which are the "extreme proportions when the iron is of a "grey quality, and smelted from argillaceous "ores. The weekly consumption of material "at top is at the rate of 54 cwt. per cubic "yard capacity. The weekly produce of "liquid matter from the hearth is nearly 28 "cwt. per cubic yard capacity.

"The produce of metal from the hearth is "at the rate of 9·5 cwt. weekly for each yard "capacity.

"Each ton of coal charged into the furnaces "suffices for the production of 23·4 cwt. of "liquid matter in the hearth. Estimated on "the carbon in the coal, the ton of iron is "produced with a consumption of 43·5 cwt. "of carbon, and the ton of liquid matter— "iron and cinder—deposited in the hearth "with a consumption of 17·1 cwt. of carbon. "The solid materials introduced into the fur- "nace weekly measure in their original form "1,166 cubic yards, the liquid matter obtained "measures 172 cubic yards. The solid ma- "terials charged at the top are in the furnace "40 hours before being reduced to a liquid "state. The solid materials descend through "the throat at the rate of 28 inches per hour, "at the top of the boshes the descent is "reduced to 7 inches per hour, but is accelera- "ted at the hearth to 35 inches per hour; "The consumption of blast per minute is at "the rate of 20 cubic feet of air to each yard "capacity of the furnace.

"The ton of iron is produced with a con- "sumption of 3,888,490 cubic feet of air. The "air decomposed in smelting one ton of iron "weighs 13 tons. The weight of the air in- "troduced through the tuyere is to the weight "of the solid materials introduced at the top "as 16 to 7.

"The materials, solid and gaseous, charged "into the furnace for each ton of iron smelted "weigh 18·8 tons. The weekly consumption of "solid and gaseous materials weigh altogether "2,442 tons, of which 380 tons are obtained in a "liquid form at the hearth, the remaining "2,062 tons escaping in the gaseous form at the "top. Hence for each ton of liquid matter "obtained 129 cwts. of gases are evolved from "the furnace.

"The atmospheric air introduced weekly "measures 1,872,223 yards; the gas evolved "from the tunnel-head measures 7,488,000 "cubic yards. The ascending gases traverse "the furnace at its largest diameter at the "rate of 415 feet per minute, increased at the "throat to the rate of 1,660 feet."

Such are the particulars of the great works at Dowlais, and we have thought fit to transcribe them *in extenso* for the satisfaction of those of our readers who may not happen to meet with the volume from which they are extracted. In relation to Dowlais, we are furnished with minute statistical information as to other and inferior kinds of iron—the rate of production, expenditure of materials, &c.—but into them we need not at present go. The celebrated Hirwain foundry is also referred to, and many valuable facts in connexion with it are given. Economy is the great object sought in almost all the works of the kingdom, and it is to be feared that this is sometimes effected at the expense of the quality of the metal produced. In no operation connected with iron-works has there been a greater reduction made in the consumption of materials than in the consumption of coals. In several Welsh works an actual saving of two-thirds the quantity at one time used has been accomplished, and this without deterioration of metal. In 1791 the consumption of coal to each ton of pig iron averaged 6 tons, in 1821 it had been diminished to 4 tons, and in 1831 2 tons and a quarter were found sufficient, and this indeed is about the proportion now employed. It would be simply impossible for us to follow closely the track of the authors of "Iron Manufacture" in their elaborate and exhaustive researches. Nothing that is of interest with respect to the mode of dealing with the materials used in the production of iron appears to have escaped their penetrative explorations, and their work is consequently laden with the rich spoils resulting from their labours.

In connection with the blast furnace, some curious and, at the same time, instructive information is given, as for example, this, "the "make of the blast furnace varies with the "season of the year. * * * It is well "known to smelters that with materials of "similar quality, and volume of blast un- "altered, the make of the furnace is greater "in the winter months than at any other "season. Until within the last few years "this was attributed to the coldness of the "air; and on the introduction of the invention "of hot blast to the manufacturers of iron, "this superiority of cold winter over warm "summer air was adduced as a reason against "using the hot blast. The greater efficiency "of cold air was considered by some writers "to arise from its increased density, which "augments, in proportion to the decrease "of temperature, a given quantity of air "containing more oxygen in winter than in "summer. The cause of this superior make "in winter is now, however, ascribed to what, "no doubt, is its true cause—the greater dry- "ness of the atmosphere in winter as com- "pared with summer."

In the seventh section of the book under review the question of the "density of blast" is discussed with much acumen and practical ability; and the abandonment of certain fallacious theories which, for a considerable time, obtained belief is commented upon. It is a fact known, we believe, that up to this hour considerable difference of opinion exists, both as to the proper density of blast necessary to produce the best effect, and as to the most efficient way of applying it. As to the latter question, the most common mode of admission for the blast is by three tuyeres, one on each side and the third at the back. Some iron-masters have, however, we are told, adopted the plan of distributing the blast, as it were, by admitting through ten or twelve apertures or nozzles.

The advantages supposed to attend the use of a large number of small pipes are—a more perfect combustion of the fuel, and, consequently, economy of blast and smelting materials, and an increased make of iron. The authors of the work under review are, on the contrary, of opinion, and that after repeated testings and experiments, that these advantages are illusory. "If the blast," they say, "be "cut up into a number of small jets, their in- "tensity and ability to penetrate the mate- "rials are inferior to those of larger jets." Arguments in favour of this view are adduced, and we think those arguments conclusive.

The form of the interior of furnaces has been much discussed, and it varies at several works. In the book before us a number of illustrations are given of the different kinds of furnaces in use, and the whole question is considered with that scientific and practical exactness which is characteristic of its authors. Those who are anxious to learn more of this part of the subject must, however, be referred to the pages of "Iron Manufacture."

In the ninth section the quality of the crude iron as affected by the structure and composition of the ores is treated of, and it must be allowed that it forms a momentous consideration to iron smelters. On this point we are told that "the quality of the iron as estimated "by the quantity of carbon in combination, is "directly dependent on the structural arrange- "ment of the ore, and that the fusibility is de- "pendent on the same causes, also varying "with the per-centage of associated carbon." This theory will clash with the notions of some who hold that the character of the fuel used has very much to do with the quality of the iron produced. We conceive, nevertheless, that the views propounded by Messrs. Truran, Phillips, and Dorman are in the main correct, and that fuel plays a secondary part only in the process referred to, so far as quality is concerned. Advancing now to the deeply-interesting question of the "hot blast," our authors at once assert that the effects of its introduction into the manufacture of iron has been "much exaggerated." "The saving "in fuel by the application of the hot blast, "and the increase of make due to it, are not "in general one-fourth of what has been at- "tributed to it." Contrasts are instituted between those works where the cold blast is still adhered to, in support of this rather startling statement, and it must be admitted, in presence of the facts adduced, that there are strong grounds on which to sustain it. The employment of furnace gases, which has occupied the attention of many able men during the last few years, has a chapter devoted to it in the work under notice. The general conclusion come to thereon is that the scheme is not likely to be attended with anything like decided success, but that, on the other hand, much time and money may be wasted in fruitless attempts to realize it. "By "calculations founded on very insufficient "data, the heat capable of being attained by "the combustion of gaseous products has been "greatly over-estimated, and in practice the "maximum working temperature scarcely "reaches a third of the theoretical state- "ment."

The use of heated air and its effects are dwelt upon at much length, and with a great deal of calm argumentation. It is not possible for us to follow the writers through their very lucid and temperately-expressed theories on this part of their subject, but we can promise those who revert to the book itself for information thereon, that they will have no cause to regret doing so. A section devoted to the employment of raw coal in blast furnaces, brings us to that which relates to blowing engines. In respect to these our authors express some very decided and practical convictions, and as those convictions are likely to be of great interest to many of our readers, it is desirable to summarize them here. There are, it is stated, in this country about three hundred and ten blowing engines. "These we have personally examined, and "consider their make and power, and the "expense of their maintenance, inconsistent "with the present advanced state of mechanical "engineering. A deficiency of power is a "defect almost universal. When it is con- "sidered that the entire process of the opera- "tions, as regards quality, produce, and "economy, is dependent on the blast, the "necessity of having superior blowing engines "of ample power, and maintaining them in

"first-rate working order, is apparent. But, "as ironmasters are not usually practical engi- "neers, most of the faults observed in their "engines must be placed to the credit of their "makers. . . . A blowing engine should "be able to work a month without stopping, "and then require not more than an hour's "delay. No really efficient engine should "need to stop more than thirty hours in a "year for current repairs." No doubt the conditions here laid down are remarkably stringent, but with those who have stipulated for them, we believe, they are capable of fulfilment. The introduction of the high pressure principle has undoubtedly been attended with much advantage; but evidently much more remains to be accomplished in perfecting and economizing the action of the blowing engine.

The refining process now so commonly resorted to in the Welsh iron works, is elaborately treated of, as are those of boiling and puddling. The use of hammers and squeezers, too, are lengthily described; and the chapter on Rolling Bar Iron is so interesting and important that it ought to be transcribed entire. That, however, is clearly impossible, and we can only promise that at some future time we will probably give copious extracts from it, as well as from the chapter on Rolling Plates, which is not less worthy of quotation.

In the 21st and last section of "Iron Manufactures of Great Britain," and under the general heading of "Sundry Notes on Iron-making," we find a fund of useful and practical information on minor points connected with the art, and which go to make the book a complete and exhaustive treatise thereon.

It is with feelings of intense satisfaction and confidence that we recommend this work to the vast and intelligent community to whom it is addressed, and we should be wanting in our duty if we closed this notice of it without making an earnest appeal to the committees of every Mechanics' Institution, and Scientific Society in the United Kingdom to place a copies of it in the libraries attached to their meeting places. The price of the book—necessarily high—places it beyond the reach of the individual workman; but by some means or other it should reach his hands. We are certain, indeed, that the heads of engineering and mechanical establishments would find it advantageous to purchase copies for free circulation among their employés. The valuable information thus distributed would make those employés far more serviceable to their masters, and at the same time bring their knowledge of the material, with which they so largely deal, up to the requirements of this essentially and almost literally iron age.

THE SEWER AND WATER SUPPLY OF PARIS.

The twenty-third volume of the "Journal of the Royal Agricultural Society of England," just published, contains the following interesting article by P. H. Frere, upon the present state of the sewers and water supply of Paris:—

England may well look with interest to the changes made or contemplated in France for the disposal of that town-refuse which is a possible source of wealth, but, if ill dealt with, a certain cause of annoyance; and indirectly its agriculture is concerned in the result. With us, to a certain extent, the die is cast; the contents of the closet have penetrated, with the kitchen refuse, &c., into the common sewer, into which they are washed by an unrestricted supply of water. To set up a wall of separation—to limit the amount of dilution—would in themselves be steps of extreme difficulty, because in one sense retrograde. Paris, on the other hand, is still, in the main, uncompromised. That city is in a state of transition; generally, the old-fashioned pit still exists, for the most part unsupplied with water; but a large water-supply has been procured for houses of the better sort. But even then the soil-pit still remains wholly or partially separated from the common sewer, and the question still is to be decided whether this separation, whole or partial, shall be maintained; and consequently whether the night-soil of Paris shall retain, as heretofore, all its solid and liquid constituents, or only the former; and again, to what extent these fertilisers shall henceforth be diluted.

After the great works undertaken to procure a water-supply from the Seine, from the Canal de l'Ourcq, and from the great Artesian well, every householder who is willing to pay the rate can have a supply of water for water-closets as well as other uses. The water company, however, endeavours to regulate and limit the supply contracted for, by making only such an aperture as will allow the amount paid for to pass in a continuous stream into an inner cistern in twenty-four hours. The following is the estimated rate of consumption:—

	Litres.	Gallons.
For a man	30	6 1-10
" carriage	75	16 1-2
" horse or cow, &c.	100	22
" water-closet	75	16, 1-2
" garden or court, per square metre (10 1-2 feet)	5	1 1-10

A contract may be entered into for 500, 1,000, 1,500, &c., litres per day, for an annual payment of 60 fr. for Seine water, or 50 fr. for Ourcq water, per 500 litres (110 gallons). The use of the water-closet is then inaugurated; how is it henceforth to be regulated?

The builder who contemplates making a house must communicate to the Board his plan of operation; the choice open to him will depend on the locality. The new Boulevard de Sebastopol, with its costly and magnificent system of sewers, is the type of the new regulations. If the house be in that quarter, a separate pit must be provided for the soil; but it will be so connected with the main sewer that the nightman will have access to it therefrom, and without entering or disturbing the dwelling, will first deoderize, and then let off the fluid into the sewer, and afterwards convey away the solid "soil" through a passage in this new subterranean town to the cart and to the reservoir. Otherwise, by another plan under consideration, the soil, &c., would drop into a cylindrical cistern, divided vertically by a perforated metal screen or sieve, through which the fluid percolates of itself into the sewer. In either of these cases the fluid elements are lost, and if these contain the higher per-centage of nitrogen, the loss may be much more than *pro rata*.

It remains to be seen whether, since this magnificent network of drains has been already organized to retain the fluid as well as solid excrement, and other means have been provided for dealing with the soil, it will pay by enlarging the pits, emptying them more often, and restricting the supply of water used in the closet. One important step has been taken towards this end. A tank fitted to a railway truck, containing 6 to 10 tons, has been made and exhibited in our International Exhibition, which will be conveyed for 60 miles on the Eastern Railroad at a charge of 2s. for 6 tons. The present "night-soil," when delivered in "hungry" champagne, is valued at 8s. per ton. If then the "soil" retain anything like its old strength, its value to the farmer will leave a large margin to pay for its transport along the subterranean street to a reservoir at the railway terminus. But if there be a great dilution, and many small sources of supply have to be visited and tapped in succession, the costs of removal will roll up, until this "gold may be bought too dear."

At all events, these philanthrophists and philosophers who long to see the circle of reproduction completed by the restoration to the field of all the human fæces which contaminate our great cities, must cast a curious and anxious eye to the magnificent new French suburb, where, if anywhere, their views may be economically realized, because a solid foundation has been laid, and there are means and appliances for the distribution which only wait for one or two connecting links. In other quarters of the town, practical improvements have been introduced, by which the carts are filled at night by means of a joint and hose fastened to an opening in the pit, so that it is emptied from the street by suction. The loaded cart then proceeds to the *depotoir*, or sink, from which the deposits are propelled by a steam-pump through a tunnel seven miles long to an opening cut in the Forest of Bondy. Here they are either desiccated and made into *poudrette*, or shipped by barge-loads along the Canal de l'Ourcq to Vaujours and elsewhere.

The Water Supply of Paris.

For centuries the supply of water for Paris has occupied the attention of the French Government. Philip Augustus erected the first fountains; his successors and the municipality organized in the squares and open supplies of water drawn from the northern springs. Marie de Medicis, restoring a Roman aqueduct, led in the waters of Arcueil. In the reign of Louis XIV., pumps were placed by the bridges of Notre Dame and the Pont Neuf, to raise the water of the Seine. A century later similar works were set up at Chaillot. But they all turned their backs on drains, and sewers and their contents, leaving the sun, the rain, and the river to settle those matters.

Water which had served domestic purposes ran in streams down the streets in mid-channel, and either joined the Seine on the south, or on the north the ditch of Ménilmontant. This ditch, when its exhalations began to threaten the health of the neighbourhood, was paved and vaulted, and converted into the main sewer which encircled the town. The outscourings were allowed to run into pits in the open fields; and the night soil collected in the pits underneath the houses was taken away by night, to be thrown, first into the charnel-house of Montfaucon pell-mell with the bones of criminals, and afterwards into the empty plaster-pits of Buttes Chaumont. Such was the system which survived to our own times. We may add, that from the sixteenth century the gardeners who cultivated the marshes of the Temple, applied to their land the sweepings and straw manure of the town; and when Paris, spreading daily, ejected them from within its bounds, by means of this same manure, they converted the plain of Vertus into a garden of inexhaustible fertility. Beidel, too, about 1,780, formed the idea of solidifying, by drying, the thick liquid in the basins of Montfaucon, and manufacturing *poudrette*, by which the first company of adventurers was enabled to pay a rent of £22,000, and reap a handsome profit.

The sanitary reform of Paris dates from 1830. The completion of the Canal de l'Ourcq, which delivers 100,000 tons of water, at a level of 27 yards above the Seine, altered the whole state of the town. The principal was adopted that a group of houses constituted a block (*ilot*), to be scoured by a stream of running water, and provided with a water-post (*borne fontaine*) on a high level, and a sewer's mouth below. An end was thus put to the torrents of filth which had hitherto deluged the streets. These were re-laid in a convex form, skirted by foot pavements; and under all the main thoroughfares waterpipes and drains were laid. The management of the night-soil underwent a like change. M. Mary was so adventurous as to propose to construct a syphon 7½ miles in length, terminating in the reservoir of Bondy, for the purpose of emptying the pestilential pools of Montfaucon. This scheme was unprecedented, and apprehensions were entertained that the pipes would become choked by the pasty matter. After five years' opposition he gained his point, and the construction of the "dépotoir" was the result. This work consists of an assemblage of cisterns, into which the produce of each night's carting is emptied. The contents are then forced by a steam-pump through an iron pipe to a clearing of seventy-five acres made in the middle of the Forest of Bondy, well out of reach of Paris and its atmosphere. M. Mary calculated that this pipe, which traversed the market gardens of Noisy, might furnish liquid manure, to be sold at a cheap rate at convenient stations. But the practice of buying town-sweepings and stable manure was so established that, until 1850, night-soil was overlooked; nor was any attempt made to introduce its use in the environs, prior to the experiments which led to the establishment of the farm of Vaujours.

About 1850 the introduction of railroads gave a new impulse to the improvements of Paris. Traffic of all sorts was increased tenfold, and, as a consequence, streets required to be widened, and the whole town, as it were, re-organized. Then it was that Government came forward and sketched the plan, which is realized in the magnificent city such as it now stands.

Two great lines now intersect one another at right angles, so as to form a cross—an idea of the time of Philip Augustus; the one, the Rue de Rivoli, runs parallel to the river; the other, the Boulevard de Sebastopol, comes sloping down from the hills on the north, and again rises to the south. On the latter line sanitary arrangements have been comprehensively planned and carried out. We find

a complete subterranean town, provided with vaulted thoroughfares 35 yards wide, macadamised or paved, which contain sewers showing a section *(profil)* of 3, 4, or 6 yards, with polished sides and serviceable foot-pavements, in which, through an inner channel, the stream of sewage-water flows, fed at the corner of each street by lesser sewers, themselves drawing their supplies from the drains which abut on every house. This is such a scheme as the English *Board of Health* suggested, but with this difference, that instead of a system of small pipes, provision is here made on a large scale for all the requirements of town life, including water and gas. Besides the rain-water and that which has been used for domestic purposes, the drainings from the closets run down these channels, the solid portion of the deposit being retained in the pits by the filter. There is no connection with the outer world. The system is self-contained; water and gravitation are the sole agents employed.

The drains connected with the private houses are oval sewers, 4 feet 2 inches by 7 feet 6 inches, in which the workman passes easily to and fro with his barrow. The main drains, constructed under the great lines of traffic parallel with the river, are circular tunnels of 10 feet in diameter, containing a railway with a 3-feet 11-inch gauge, and a channel for the waters between the lines of rail. Lastly, the main sewer, which forms a chord to the windings of the Seine, between the Pont de la Concorde and the Pont d'Asnières, is an elliptic tunnel, having a horizontal diameter of 20 feet, in which is contained a canal 11 feet 8 inches wide, traversed by a barge, with a footpath on either side 3 feet wide. All these works are executed in cement, so that the smooth and polished walls and their softened outlines reflect the light, transmit sound, and give free passage to the waters, which leave no taint behind. From the dwellings they received grease, the refuse from the kitchen, and the household water *(eaux menageres)*, as well as the disinfected liquids drawn from the pits of the closets. The paved streets transmitted their mud, and the macadamised boulevards their scrapings. Markets, slaughter-houses, barracks, paid their tribute of manure—vegetable refuse, blood, urine, or undiluted night-soil. This confused mass, mixed with water, issued from the sewer's mouth at Asnières in a thick and dark stream, flowing at the rate of 1 ton per second.

To provide against the accumulation of a great mass of filth near the sewer's mouth, the following ingenious device was adopted :—

The centre of the main drain is occupied by a canal 2¼ miles long, having a fall of 1 in 2,000. On this canal a barge is employed, from the fore part of which is suspended a metal flood-gate *(vanne)*, which fits exactly to the sides of the tunnel up to a certain water-level, and lowered by leverage to within a few inches of the bottom. By these means the stream is headed up behind the floodgate, which as soon as there is a head of two feet of water, forces out through the small aperture left below a perfect torrent of refuse, sand, and even stones, which are mashed and rolled together, and thrust onwards in a long drift 100 yards in advance.

As the barge itself is propelled slowly forwards by the stream which it holds in check, the torrent keeps advancing, and the outscourings never find a resting-place till, at the end of ten days, the mouth of the sewer is reached. The boat then performs its backward journey by the aid of floodgates lowered from the roof. These, acting like locks on a canal, raise the water to an artificial level for a distance of 11,000 yards at a time, by which means the barge is gradually floated back.

The lighting and signals had still to be provided for. At first small lamps, such as are fixed to railway trains were tried, but their light was found to be too dazzling to those in front, whilst it left those in the rear in deep shade. A common oil-lamp in a glass globe, distributing its light equally around to a distance of ten yards, was ultimately preferred. Red, blue, and green railway lanterns answer perfectly for signals.

Thus far provision had been made for cleansing the town, but at the cost of the Seine, where a pestilential delta would be formed at the sewer's mouth. The great point was to extract all solid matter from the stream without interrupting its flow; this alone would lodge and accumulate; this would interfere with working pumps for irrigation; liquids would float away with the stream, and would undergo slow combustion when in contact with the air, and vanish.

The various solid bodies contained in the stream, though blended together by the flood, would not really mix or amalgamate. Their specific gravity would determine their position; the grease would float, the sand sink rapidly, straw and organic matter would be found in various degrees of suspension. They must all be disposed of.

The grease is, in great measure, collected as a scum behind the barge, where it is skimmed off and employed in making black soap.

The first attempts at "straining" the stream were unsuccessful. The straw manure required a special device.

A simple bar became blocked with a tangled mass of straw and dung. A barrier of plate-iron pierced with holes, made to fit the aperture exactly, and therefore 8 ft. 8 in. wide, which was fixed in a sloping direction, hardly arrested any of the floating substances. The openings were bunged up, and the straw, &c., glided up the inclined plane and topped the fall.

The last device was to make a wooden grating, with bars placed lengthways, three-quarters of an inch wide and three-quarters of an inch apart, inclined in the direction of the stream's flow. The length of the incline was 26 feet, which gave a slope of 1 in 5. The workmen, armed with rakes, who combed and scraped the gratings, collected as much as five or six tons of rubbish per day.

Whilst the work was still experimental the sewer supplied in four months 500 tons, which was not only so much infectious matter got rid of, but manure placed at the service of agriculture.

The nursery gardens of the Bois de Boulogne were not slow in adopting its use, and found its action very rapid—as the gardeners say, if you expose it for twenty-four hours to the air it takes fire. With alternate layers of clay or marl it forms an excellent dressing.

To return to our subject. The collecting the sand which moves along the bottom of the sewer was a very simple matter. Only make a barrier, and a bank will soon be formed against it, which the steam-drag, such as is worked in the Seine, will readily remove. Even these sands may be serviceable to agriculture; they are fine, and blackened with organic matter like peat, and may therefore prove a useful dressing to chalk and clay lands.

Accumulations of gas remained to be dealt with. Where there is sewage-water, it is always accompanied by a discharge of carbonated hydrogen gas, which rises to the surface in numerous little bubbles. As the sewer has been so planned as to have a fall of about 13 inches where it joins the Seine, the water, when broken in the fall, parts with a portion of the gas contained in it. To take advantage of this, a cowl has been built over the cascade, which is surmounted by a fire of glowing coke; the blue flame of the carbonated hydrogen is easily recognized at the top of the vent, where it mounts and undergoes combustion, instead of bubbling up in the fleeting current.

To sum up these details; the foul stream which enters the sewer of Asnières, to be turned into the Seine at the lowest possible point, first encounters the barge with its movable flood-gate. Finding no escape but by the aperture near the bottom, it is converted into a scouring torrent, which whirls along all the deposits for a distance of two and a half miles. A sort of floating island of scum is formed round the boat, from which the grease is collected for industrial purposes. At the mouth of the Seine the stream next encounters a long grating, suspended in mid-channel but disconnected with the bottom that the sand may pass freely. There it parts with all its floating substances, such as straw, vegetables, or wood, which form a bed *(paillasse)* on the inclined plane, from whence they are removed by drag-rakes.

Still farther on a bar is so placed as to form a fall of 13 inches; the sand is thus arrested, and the bank which it forms is continuously removed by the scoops of the steam-drag. The hood, with its fire of coke, placed over the fall, attracts and consumes the noxious gases.

The solid and gaseous bodies being thus disposed of, nothing remains but the fluid, which contains matter in chemical solution, and this may properly be turned into the Seine, because its purification will soon be accomplished by slow combustion under the influence of the atmosphere; the dark stain caused by its admixture will soon be obliterated, and before reaching Passy the river will have regained all its purity.

These statements have been chiefly derived from two reports by M. Mille, published in the Appendix to the "Annales de Vaujours." For further explanations I am much indebted to the excellent models of sewers exhibited, among many others, in the French Department of the International Exhibition, as well as to the courtesy and patience with which the gentlemen in charge of these models have answered my inquiries.

When examining these models I at the same time saw with interest the pipes manufactured by M. Hermann et Compagnie, contractors for the Paris waterworks. These pipes are perfectly smooth within and without, and uniform from one end to another, without any kind of projection. When a joint is to be formed, a band of india-rubber is slipped over the ends of two pipes placed in juxtaposition. Over this band two iron rings, slightly conical in form, lying ready to hand on either pipe, are driven home till they almost meet. By this simple but effectual kind of joint, the use of solder and of skilled labour is dispensed with, the re-adjustment of one or two lengths much facilitated, whilst it is found in practice that for any given bore, required for any purpose, one-fifth less iron may be employed than has been usual. The pipes of all sizes now laid down for the Paris Waterworks are thus united.

VENTILATION OF SHIPS.

A new ventilating apparatus has been erected on board her Majesty's ship "St. Vincent," by Mr. Wilson Phipson, C.E., of London, the results of which are satisfactory. Mr. Phipson has obtained from the Government an order to ventilate the lower deck of her Majesty's ship "St. Vincent" as a trial experiment. It was thought that a trial with a deck 190 feet long and only 7 feet high, in which 450 persons are swung up to sleep every night, would constitute as severe a test as was possible to be found. In the hands of Mr. Phipson it has, however, proved a complete success. The whole of the air of that 190 feet deck is renewed every 15 minutes without the least perceptible draught; and where before the atmosphere was almost stifling, now not the slightest odour is perceptible, and the men and boys enjoy a healthy night's rest. In the company of Captain Marcus Lowther, the commander, Dr. Cunningham, surgeon, Dr. Phipson, F.C.S., and several others, Mr. Wilson Phipson proceeded to explain his apparatus, and to make experiments by filling the deck with smoke, to point out the manner in which the air was renewed and the time required for its renewal. The fresh air enters by an artificial patent winsail, containing a ventilator, which is connected with a two-horse power steam engine. The things are so arranged that with 40, 50, 60, or 80 strokes of the piston per minute, 4, 5, 6, or 800,000 cubic feet of pure air are supplied per hour. The supply given depends upon the number of individuals, each person requiring a certain amount of air per minute, and the apparatus is so disposed that an amount a little greater than can ever be required is furnished by the machine without any perceptible draught. The air, it appears, enters the deck in cyclones which are bipolar, or composed of two curves, a curve of maximum and a curve of minimum velocity. The quantity supplied is indicated at any moment by the needle of a dynamometer connected with the ventilator. The expense of this ventilation, supposing 700 men on board, is, as near as we have been able to calculate, about seven-tenths of a farthing per man per night.

STEAMBOATS LIGHTED WITH GAS.

"The Wallasey Commissioners," says a Liverpool paper, "who have taken the lead in introducing the most perfect construction of ferry-boats that ever floated on the waters of the Mersey, seem determined to maintain their supremacy by availing themselves of every improvement in navigating the river which art or science can suggest. Their splendid new boat the "Water Lily," built by Messrs. George Forrester and Co., and Messrs. Jones, Quiggin and Co., is now lighted by gas throughout. Instead of the dull, lurid flame produced by oil, the signal lamps are brilliantly illuminated by a jet of the clearest gas-light. At night the engine-room is now quite light, every part of the machinery, in fact, being more clearly visible to the engineer than during the day-time. A couple of sun-burners at once give light and ventilation to the passengers in the saloons, rendering these places more like ele-

gant drawing-rooms than the cabins of a steamer. Mr. Highfield, the skilful manager of the Wallasey Gas-works, has most successfully accomplished his purpose, and we congratulate him on being the pioneer in applying his genius to bring out an invention that must add so materially to the comfort and safety of those persons who are compelled to cross the river by night. It does not require more than fifteen minutes to charge the receiver with sufficient gas for a night's supply. The apparatus is constructed to prevent all possibility of an explosion, and is ot in any way affected by the motion of the boats. The cost of illumination will be at least 50 p r cent. less than that of oil. The light only requi es to be seen in order that its superiority may e appreciated; and as in a small vessel the rece er is capable of containing a supply for three nights' consumption, we may expect in a short time to have our steamers as they cross the Atlantic brilliantly lighted with gas. Truly this is an age of progress."

WARNE AND CO.'S CONSOLIDATED EMERY WHEELS.

ON Wednesday last a trial of Warne and Co.'s newly-patented emery wheels, took place in the Western Annexe. These wheels are intended as a substitute for and an improvement on the ordinary leather emery wheel—used for polishing iron work—more especially case-hardened work. We saw on Wednesday last two kinds of wheels experimented on, one of which was a small desk composed of vulcanized india-rubber and emery, and the other was composed of oxydized oil and emery. The latter was superior and, we were given to understand, cheaper than the former. Oxydized oil, a newly-invented substance, bids fair to become of considerable value. In the present instance there can be no doubt of its utility. We are informed that wheels composed of vulcanite and emery are equally effective for cutting, grinding, and polishing iron or steel of any description. They are mounted on spindles in the same manner as grindstones or other grinding wheels.

SIR CHARLES BRIGHT'S IMPROVEMENTS IN ELECTRIC TELEGRAPHS.

(*See page* 231.)

SIR CHARLES T. BRIGHT, formerly engineer to the Atlantic Telegraph Company, has just patented further improvements in telegraphs, a portion of which we can only find room for in this journal.

"In the first part of my invention," he says, "which has reference to the receiving apparatus or relay, I employ conducting fluids in a state of motion, into which the movable part of the relay is inserted or removed, in order to make or break local or secondary circuits, so that the conducting surface with which contact is made or broken is constantly changed; and I prefer for this purpose a fine stream or fountain of mercury, or acid and water, but I do not confine myself to these fluids, as any other suitable conducting fluid may be used.

At fig. 1 is shown a relay, with a reservoir for holding the mercury or conducting fluid in which A A^1 are a pair of coils of fine wire; *b* is the axle of a magnetic needle contained within and actuated by the coils; the axle *b* has fixed to it an arm *c*, which is stopped on each side by two adjusting screws in the usual manner, one of which is shown at *d*. The ends of the coils are led to terminals *e e*, which are connected to the line wire and to the earth. The reservoirs F F^1 are fixed to a tube *g g*, fitting closely round the arm or bracket *h*. The necks of the reservoirs are hollow, and their orifices *i i* are opposite to two passages in the arm *h* (shown by dotted lines), when the reservoirs are in a vertical position; *k* is a pipe fixed to the arm *h*, communicating by the dotted passage with the upper reservoir through which the stream of mercury or conducting fluid flows to a receiver *l*, and thence through the lower passage, marked also by dotted lines, to the lower reservoir. When the upper reservoir is empty, the position of the two reservoirs may be changed by the crank handle *m*, which carries a pinion *n* gearing into a wheel *o*, which is fixed to the end of the tube *g g*. The upright P, which supports the bracket *h h* and the reservoirs F F^1, is connected to the terminal *q*. The upright R, which supports the coils A A^1, and carries the axle *b* of the magnet within the coil, is connected to the terminal *s*. The local or secondary circuit being connected to the terminals *q s*, on a current being sent through the coils A A^1, the arm *c* comes in contact with the fine conducting stream flowing from the pipe *k* to the receiver *l*, and thus completes the local circuit.

"By this means perfect contact may be made with the most delicate horizontal needle, and the power required to work long circuits is much reduced; signals may be recorded by the arm resting in the stream of fluid or by passing through it. If signals be required on each side of the relay the arm may terminate in a fork and may be suspended, together with a magnetic needle, by a fine thread of silk, the axle being prolonged below and dipping in a cup of mercury so as to be in connection through the upright R with terminals *s*.

"I also employ a series of streams or fountains of conducting fluid, the motion of the movable part or parts of the receiving apparatus among them causing various degrees of motion of such movable part or parts to be marked upon any suitable recording apparatus included in the local circuit, by which various deflections, and the time in which such deflections rise and fall, may be recorded on paper.

In the second part of my invention, which has reference to registering or recording the effects of electrical currents, I employ a band of paper, drawn on by a train of clockwork or any other convenient motive power, and I cause a colouring fluid or fluids in a state of motion to impinge upon the paper and mark a line or a series of lines thereon; the line or series of lines is broken from time to time through the colouring fluid being intercepted by an arm or arms moved by the electric currents, and thus the duration of the currents or their variation of force may be directly recorded upon paper; and for registering the effects of earth currents I employ the clockwork train, carefully regulated as regards its speed of motion, so that the time of any deflection may be noted upon the paper.

Fig. 2 represents the key adapted for regulating the ordinary single current alphabet of dots and dashes. *a a* is a lever key working upon an axle *b*, and operated by the pressure of the finger upon the ivory button *c*. The key and the base *d d* upon which it is fixed are connected with the terminal *e* by the metallic strap *f*, and the terminal *e* is connected to the line wire when the instrument is in use. The stud *g*, which stops the motion of the key, is connected to the terminal *h*, which is connected to one pole of the battery, the other pole of the battery is connected to earth so that a current flows into the line when the key is depressed. At the short end of the key is a screw *i*, the lower end of which presses against a small arm or lever *k*, and thus prevents it from coming in contact with the screw *l*, against which it would otherwise be pressed by the spring *m*. A click *n* attached to the arm *k* takes hold of the rough surface of a wheel *o*, upon the axle of which is fixed a spur wheel *p*, which gears into a train of wheels terminating in the fan *q*. When the key be depressed the click takes hold of the wheel *o*, and the speed at which the arm *k* rises is regulated by the adjustment of the fan *q*; the screw *l* is connected to the terminal *r*, which is connected to the other pole of the battery (or to some immediate point in the battery), so that if the key be depressed for a longer time (say for sending a stroke) than the time at which the arm *k* arrives against *r*, the battery is placed upon short circuit, and no current flows along the line (or a part of the battery only may be cut off) if the connection with *r* made at an intermediate point. By this means a longer interval takes place after a long signal than after a short one, although the operator is manipulating the key with the usual pauses, irrespective of the currents actually sent into the line; and when once the rate of motion of the arm has been properly adjusted to the requirements of the line operated upon, the signals will come out at the other end with equal spaces between them.

A second arm, controlled by a fan to regulate the time of commencement of the currents after spaces of greater length than the spaces between the separate signals, may be used on circuits of very great length.

WHITWORTH'S IMPROVEMENT IN PREPARING PROJECTILES.

MR. JOSEPH WHITWORTH, of Manchester, whose name in connection with munition of war, is patent to the world, has patented a machine for preparing projectiles, which consists in placing the projectile in a chuck and turning the fore and rear parts simultaneously, or by consecutive operations, without removing the projectile from the chuck in which it is held. The engraving shows the machine employed for this purpose, having a holder or chuck, in which the projectile is held in the middle or intermediate of its length; the machine is arranged so that the chuck may be made to revolve, and that the tools which produce the required shapes to the ends may be moved up to and from the fore and rear parts respectively of the projectile, or the projectile may be held and presented to revolving tools.

The frame of the machine carries a central standard, in which revolves a conical chuck, driven by a band passing around the pulley; the said conical chuck carries a die which holds the projectile to be operated upon, which has previously been brought to the proper diameter and exterior form (excepting as respects its fore end) by pressure in dies; the fore end of the projectile and the hollow at the base has also previously been, by preference, approximately formed by pressure. D D are two slides, which carry cutter blocks; and cutters which are simply knives or blades of steel sharpened at the edge, are so formed as to give the required shape to the ends of the projectile. Two hand levers are employed moving on axes at their lower end, and carrying studs entering between collars on the slides D D, so that these may be forced up and withdrawn by means of them. The collars are adjustable to suit the required length of the projectile. The projectile is put into the die and removed therefrom by hand, the die fitting it with moderate tightness. If it be desired to turn cylindrical projectiles the die should be split or made in two parts, which are drawn together by means of a conical bearing, into which the die is forced, and so the projectile is held firmly whilst it is being turned.

In applying to projectiles suitable lubricating materials, a portion of the surface is coated with the lubricator, applied in spiral strips or ribs, that is to say, those parts are coated or more thickly coated which, when the projectile is in the rifled barrel, correspond with its grooves or recesses, by which means provision is made for easy loading without greatly reducing the diameter of the projectile. The projectile may be covered with paper or a thin metallic or other suitable coating to prevent the barrel from leading, and in that case the lubricator is applied or more thickly applied spirally upon the covering material.

This part consists of a piece of metal, bored and rifled internally, in the same manner as the rifle from which the projectiles are to be fired. Into this the projectile previously, by preference, covered with paper as is usual, is introduced at the top, and pushed down to the lower end of the instrument. The apparatus is slotted, and is, with the bullet within it, dipped into melted beeswax or other suitable lubricator, which, entering through the slots, coats the bullet at the parts which do not come in contact with the bore of the instrument, so that the bullet, when pushed out by the way it entered, is found to be lubricated as required. A plug is employed

to prevent the lubricating material entering the hollow at the base of the projectile.

When paper or similar covering is used, the end of the paper is twisted into the recess against the resilient material in the rear end of the projectile, and by causing the projectile to revolve in a lathe, or other suitable machine, the end of the paper is concentrically twisted and pressed into the recess against the resilient material by suitable tools, such as a piece of boxwood, with a conical recess at one end, and before or at the time the covering is put on suitable resilient materials made of fibrous or other elastic substances is inserted into the recess; this is done in order that the paper or other covering may be quickly and uniformly detached from the projectile in such a manner as not to interfere with its flight. The resilient material preferred is blotting paper reduced to a pulp by cutting and chopping. Finely-curled hair made into small spheres also answers the purpose.

GUYET'S COUPLING FOR UNITING PIPES.

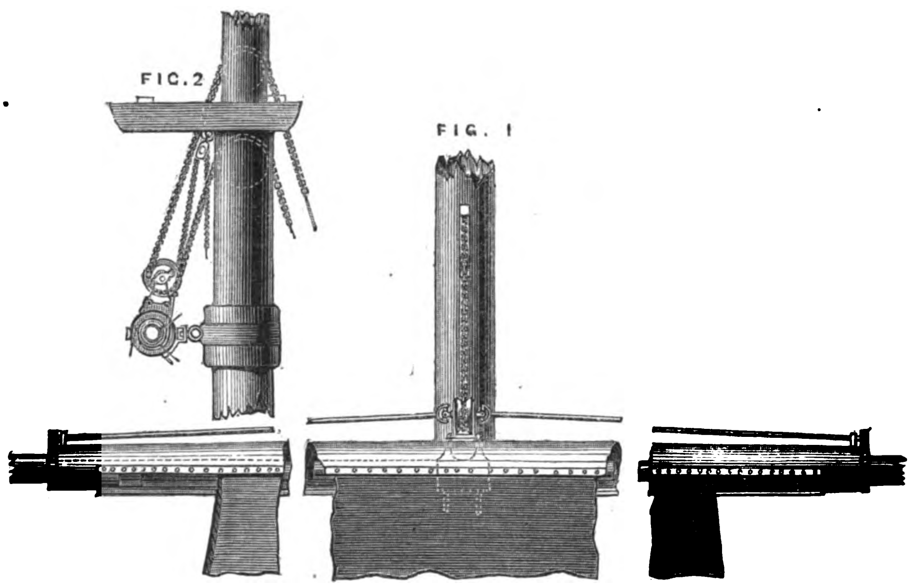
THE engraving illustrates an elastic coupling, for uniting pipes between locomotives and tenders, recently protected by M. P. J. Guyet, of Paris. The coupling consists of a central box *a*, furnished at each end with flanges, through which short pipes are inserted. These pipes, *b* and *c*, are free to move endwise in the box, and are kept steam or water-tight by suitable packing. The inner end of the pipe *c* has a stop on it to prevent it being drawn out so far as to be disengaged. The dotted lines indicate the various positions which may be taken by the pipes during the running of the engine, the flanges on the box being well mounted for that purpose. The pipe *a* has another pipe branching from the upper part, through which steam from the boiler may be drawn.

MEDHURST'S IMPROVEMENTS IN REEFING AND FURLING SAILS.

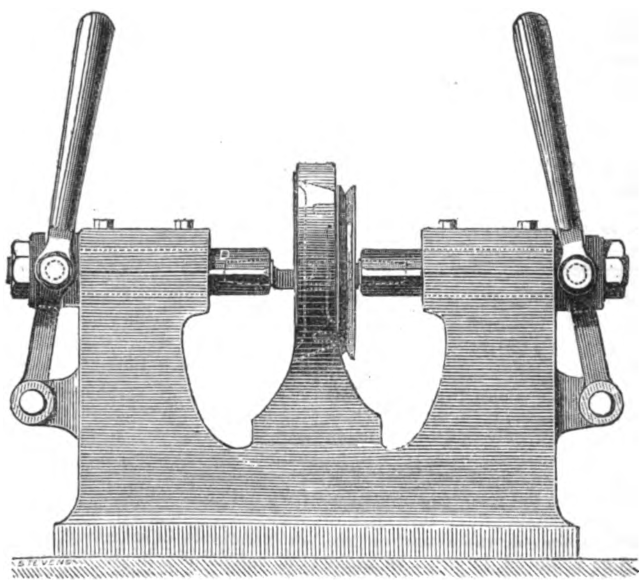
MR. J. MEDHURST, of Rotherhithe, has patented an improvement in apparatuses for reefing and furling sails, which he describes as follows:—In arranging topsails and other square sails, except t courses ,the yard is made of iron and hollow, and there is a bar or tube, by preference of iron, cased with wood, in the centre of the hollow part, and somewhat exceeding the breadth of the head of the sail in length, as represented in the engraving. This bar or tube is so arranged that it can revolve on centres or bearings at its ends. On this bar or tube the sail is laced, and when it is made to revolve the sail is wound around it. In order to reef the sail the yard is lowered, and the sail is at the same time wound up upon the bar or tube, which is caused to revolve. The apparatus is actuated in the following manner:—A chain from the deck passes through a sheave in the mast over the yard, and then around a chain wheel fixed to and above the yard at the slings. The chain then passes up and around a second sheave on the mast, and then returns to the deck, so that when the yard is lowered by slacking off one end of the chain, the whole weight of the sail, roller, and yard being pendant on the chain will cause the chain wheel to revolve. This chain wheel puts in motion two axes extending in either direction towards the extremities of the yard; these have pinions at their ends which gear with cog wheels at the ends of the roller to which the sail is attached. As a security against the roller being bent, or otherwise damaged by the wind blowing in the sail, there is a broad hook, made by preference of sheet iron, and so placed as to support the middle of the roller; this hook is connected with a purchase, so that when the sail is set, or after it has been reefed, the hook may be made to take the weight of the sail. Both ends of the chain are arranged so that they may be hauled on or slacked off from the deck, so that any desired amount of rotation may be given to the roller.

In arranging apparatus for reefing courses a modification is made in the construction. The roller and hollow yard is then made stationary, and the roller is driven from the deck by an endless chain passing round the chain wheel. It should be explained that by this invention the sail can be made as an ordinary topsail (or other sail), but without reef points, clew, or buntlines, the apparatus being made to stow the whole of the sail; or it may be made only to take in the reefs, and the sail may then be afterwards stowed in the usual manner.

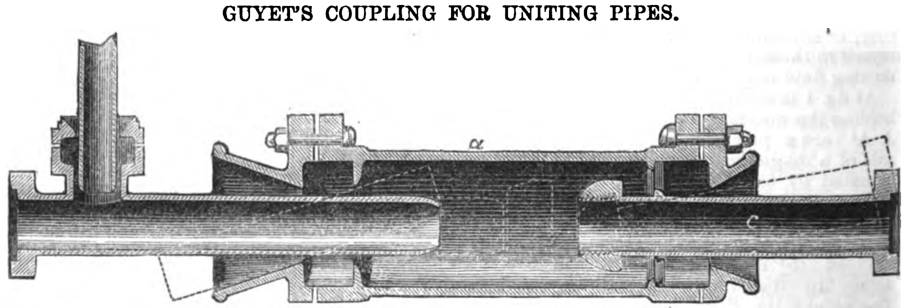
MEDHURST'S IMPROVEMENTS IN REEFING AND FURLING SAILS.



WHITWORTH'S IMPROVEMENT IN PREPARING PROJECTILES.



GUYET'S COUPLING FOR UNITING PIPES.



From an official report on the railways of India, recently published, it appears that we have already expended £40,000,000 on them, and have engaged to spend £17,000,000 more. This year we are to spend £17,000,000. We had opened 1,609 miles of railway when the year began, and are to open 1,181 more before it ends. And by making these lines we not only bring distant parts of the country into communication with each other, but give to large numbers of natives employment at once remunerative and instructive.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

(Continued from page 213.)

MATHEMATICAL AND PHYSICAL SCIENCE.

SECTION A (Mathematical and Physical Science) assembled, under the presidency of Professor Stokes, in a lecture-room in Trinity College.

BALLOON NAVIGATION.

Dr. Isaac Ashe, M.B., read a paper containing some suggestions on balloon navigation. He proposed a simple contrivance by means of which the opening of the escape-valve should depend, when desirable, on the relaxation of voluntary exertion on the part of the aëronaut, so that in case of insensibility occurring at great altitudes the valve should open spontaneously by means of a weight attached to its rope, thus obviating the danger to life incurred by Messrs. Glaisher and Coxwell, in their recent ascent from Wolverhampton, in consequence of their becoming insensible. Dr. Ashe also proposed the adaptation of screw propulsion to balloons, suggesting a very light screw, capable of elevation and depression through an angle of about 150 deg., so as to be capable of being hoisted while the balloon should be on the ground—of being used horizontally as a propeller, or ~~vertically~~ underneath the car, to cause a temporary ascent, as for the purpose of crossing a mountain range without loss of ballast or a descent without loss of gas. Such a screw, he considered, could be worked at small elevations—2,000 ft.—by the exertions of the aëronaut, and its advantages would consist in the conferring of definite direction and also of steering power, and in obviating the objection to hydrogen balloons, which consisted in the expense of the gas, as the descent could be effected without loss of gas. Hence smaller and much more manageable balloons might be constructed than those now used, and propulsion would be so much easier. Steering power being gained, Dr. Ashe hoped that a modification of shape might be found practicable, so as to present a minimum of resistance to the action of the screw. He proposed to steer by means of two small screws connected by a cranked axle placed at right angles to the axle of the propellor, and in front, so as not to interfere with the hoisting of the propellor. These steering screws should have their spirals turned the same direction, and by revolving them in one direction, or the reverse, the balloon might be made to rotate vertically, as might be desirable. The disagreeable rotation incident to balloons would also be thus obviated. Dr. Ashe suggested the employment of balloons in investigating aërial currents, and for the exploration of unknown continents, as Australia and Africa. Water—the great desideratum in such explorations—could be observed from an elevation when it would otherwise be passed by unobserved, and, a descent being effected, its position might then be taken by observation, and marked for the guidance of foot explorers. Similar remarks would apply to the discovery of the easiest routes by means of balloon observations.

Mr. James Nasmyth gave a *viva voce* account of his discovery of some remarkable details of the solar surface, which led to an animated discussion.

Professor Challis communicated two papers; one on the extent of the earth's atmosphere, and the other on the effect of the atmospheric refractions of the sun, moon, and planets. In the former it was maintained on theoretical grounds that the terrestrial atmosphere is definitely bounded, and does not extend so far as the moon; and reference was made to balloon ascents as likely to furnish data for an approximate calculation of the actual height. In the second paper reasons were given, from the results of calculations applied to astronomical observations, for inferring that the moon has an atmosphere of very small extent, the effect of which is perceptible in the occultations of stars.

Professor Hennessy read a paper on some characteristic differences between the configuration of the surfaces of the earth and moon. He pointed out that the peculiarities observed on the surface of our satellite could be ascribed to the sole action of volcanic forces, whereas those which we find on the earth result from a combination of volcanic and atmospherical agencies. In order more perfectly to study these contrasts he called attention to the most characteristic feature of all lunar volcanoes, namely, the ring or hoop-shaped crater, surrounded by circular or nearly concentric ridges. On the earth's surface volcanoes deviated more or less from this type, and if the deviations be due to the differences between terrestrial and lunar superficial forces, it must follow that such differences will be most distinctly manifested in those cases where such terrestrial forces possess the highest degree of energy. He illustrated this proposition by referring to the peculiar structure of the volcanoes in the island of Java, where the action of tropical rains and hurricanes has been effective in producing the very widest differences between the terrestrial volcanic summits and those observed on the moon's surface. Instead of the hooped structure of the latter, we see at Java specimens of radiating ribs, like those of a folded lamp-shade, or an umbrella half-closed—an appearance due to the very regular manner in which the tropical torrents scoop out the friable and scoriaceous summits of the craters.

Mr. Isaac Ashe, M.B., read a paper suggesting the use of compressed gas applied on a new principle to the elevation of a column of liquid for barometric purposes. He proposed to produce an invariable amount of compression of gas for this purpose by means of an invariable weight compressing in a vacuum a miniature gas reservoir carefully made air-tight by gilding. The pressure of the air and that of the column of liquid would then vary inversely, and by employing water or oil in the tube the same amount of variation in the height of the column might be obtained by this contrivance in a tube 42 inches long, as it is at present obtained with the water barometer having a tube of 34 feet in length. Mr. Ashe also proposed the employment of a bulb, with a very minute aperture at the top of the barometer tube by which to permit the necessary access of air to the top of the column of liquid; the advantage of this contrivance would be the prevention of constant and but momentary variations in the height of the column of liquid, owing to the passage of momentary ascensive gusts, which would otherwise cause such constant oscillations as to render so sensitive an instrument valueless.

MECHANICAL SCIENCE.

Section G, Mechanical Science, assembled in the Schools; Mr. W. Fairbairn, L.L.D. and F.R.S., President.

The President opened the proceedings by delivering an interesting address on the progress of mechanical science, especially during the past year. He then passed on to the Exhibition, and said:—"A very casual glance at this Exhibition, when compared with that of 1851, and that of Paris in 1855, shows with what intensity and alacrity the public mind has been at work since the people of all nations were first called upon to compete with each other in the peaceful rivalry of mechanical art. As one of the jury I examined with care and attention the whole of the mechanical inventions and machines in the International Exhibition. There is no new discovery of importance, except that the machines are more compact and better executed than at any previous exhibition. Taking the Exhibition as a whole, there is no very great, nor very important, discovery in mechanical science, but there is a great deal to be seen of a character both interesting and instructive. In land steam-engines there is nothing particularly attractive, if we except the growing importance of the horizontal, which is rapidly supplanting the beam, or vertical, engine. To the horizontal system may be applied economy in the first cost, and nearly equal efficiency in its application to mills and for manufacturing purposes. Another important feature in these engines is their smooth and noiseless motion, their compact form, and the facility with which they can be applied as helps, or assistants, to those of larger dimensions. They are, moreover, executed with a degree of finish and accuracy of workmanship which cannot easily be surpassed. In the agricultural department the same observations apply to this description of engine, where it is extensively used on a smaller scale. They are equally well made, and the country at large are chiefly indebted to our agricultural engineers for many ingenious contrivances and for their successful application, not exclusively to the farm, but to many other useful purposes in the economy of rural life. From the motive power employed in our manufactories and its adaptation to agriculture, let us glance at the beautiful execution, compact form, and colossal dimensions of our marine engines, and we shall find in combination simplicity of form, concentration of power, and precision of action never before equalled in this or any other country. Those who have examined the specimens of Mr. Penn and Messrs. Maudslay and Field in the International Exhibition must have been struck by the beauty and exactitude with which these engines are manufactured. (Hear, hear.) In this department of construction we are without rivals, and it is a source of pride that this country, as the first maritime nation in the world, should stand pre-eminently first as the leader of naval propulsion. In locomotive as in marine constructions we are not behind, if we be not in advance of, other nations; although it must be admitted that several splendid specimens of engines from France and Germany are exhibited by some of the best makers of those countries. There is, however, this distinction between the continental locomotives and those of home manufacture, and that is, in this country there is greater simplicity of design, compactness of form, and clearer conceptions in working out the details of the parts. These operations, when carefully executed to standard gauges, render each part of an engine a fac-simile of its fellow, and hence follows the perfection of a system where every part is a repetition of a whole series of parts, and in so far as accuracy is concerned, it is a great improvement on the old system of construction. The other parts of the Exhibition are well entitled to a careful inspection. In minerals and raw materials the collections are numerous and valuable, to an extent never before witnessed in any exhibition, and the articles, fuel and ores, will be found highly instructive. The machinery for pumping, winding, and crushing is upon a scale sufficiently large and comprehensive to engage the attention of the mechanic and miner, and it is only to be regretted that in every case competent persons are not in attendance fully prepared to explain and initiate the inexperienced student in the principles of the workings, and the cases of instruments so neatly classified and spread before him for instruction. In the machinery department, although there is nothing that strikes the observer at first sight as new, yet there are many useful improvements calculated to economize labour, and facilitate the operations of spinning and weaving, and in tool-making there never were at any former period so many hands and heads at work as on the occasion pending the opening of the Exhibition. I do not believe that at any former period there has been such an exhibition of machines and of tools, which are the creators and makers of the machines themselves. (Hear, hear.) Some of the tools, such as the turning, boring, planing, and slotting machines, are of a very high order, and the tool machinery for the manufacture of fire-arms, shells, rockets, &c., is of such a character as to render the whole operations, however minute, perfectly automaton, or self-acting, with an accuracy of repetition that leaves the article when finished identical with every other article from the same machine. Such, in fact, is the perfection of the tool system as it now exists that in almost every case we may calculate on a degree of exactitude that admits of no deviation beyond a thousandth part of an inch. Among the many interesting mechanical objects exhibited in the two annexes may be noticed as original the spool machine for the winding of sewing thread on bobbins; the machine for

making paper bags, invented by a pupil of my own; the saw riband machine, and others of great merit as regards ingenuity of contrivance and adaptation of design. In manufactures, in design, and in constructive art there is everything that could be desired in the shape of competitive skill, and, without viewing the success of the Great Exhibition of this year in a pecuniary point of view, we may safely attribute its great success to the interesting and instructive character of the objects submitted to public inspection." The President concluded with some observations on iron-clad ships, and recent gunnery experiments, with which our readers are conversant.

Mr. James Nasmyth described his solid bar valve motion, which as an improvement on the ordinary "link" valve motion was found most successful, and, since he contrived it in 1852, has been introduced with great success by Mr. Humphreys, as might be seen in his magnificent marine engines at present in the International Exhibition. The great simplicity of Mr. Nasmyth's solid bar link motion and its many practical advantages were, as it appeared, well calculated to cause its very general adoption, as the most simple and effective form of that important detail of the steam-engine.

Economizing Fuel.

Mr. Edward Ellis Allen, of London, read a paper "On the Importance of Economizing Fuel in Iron-plated Ships of War," and described a new double expansive marine engine, constructed according to his patent by Messrs. J. and G. Rennie, exhibiting photographs of the same, taken at their works. The author pointed out in detail the principles of marine engine construction which experience had shown to be absolutely essential in order to economize the fuel—viz., full expansion of the steam, surface condensation, superheating the steam, heating the feed water, jacketing the cylinders, and proportionately increasing the boiler power; and contended that in the ordinary marine engines now fitted to the iron-plated ships, though by the best makers, and of the most admirable workmanship, economy of fuel was impossible. The necessity of largely increasing the cylinder capacity to admit of expansive working, rendered an entire change in the forms of marine engines imperative, the large diameter short-stroke engines of the present day consuming as much as 4½ lb. of coal per indicated horse power per hour, whereas double expansive engines, on the plan suggested, and every way suited for Government vessels, would save 50 per cent. of the present consumption of fuel. The amount yearly voted for coals for the navy now exceeds £300,000 per annum, and the author stated it as highly probable that it would rise to upwards of a million sterling, when our iron-cased fleet was complete, unless changes were made in the construction of engines employed in war steamers. The engines referred to had been frequently submitted to our Admiralty, and the author hoped there were prospects of his plans being tried, Messrs. Rennie being prepared to guarantee their efficiency and economy. He concluded by referring to the engines proposed by him in 1855, and similar in principle to those made by Messrs. Rennie, but worked by means of a trunk instead of double piston rods, the former plan being, he believed, adopted for the engines of the "Poonah," now constructing for the Peninsular and Oriental Company by Messrs. Humphreys and Tennant.

Mr. Scott Russell said they were all agreed that the short-stroke engine was wasteful of fuel in marine engines, and of the powers to gain speed. The importance of saving fuel to the Admiralty was so great that they ought to take the lead in experiments for this purpose. Without saying that Mr. Allen's invention was the best that could be devised, he would say that the combination he suggested offered considerable hopes that an economy of fuel would be attained without reducing the work performed by the engines.

The President said that he had always found that experimental tests in working steam by expansion were always more successful than they were found to be in the actual working. Unless, therefore, the experiments were carried out on a large scale and on a long voyage, and an average obtained, they could not be considered altogether satisfactory.

Mr. Allen said that the "Moolton's" voyages gave very successful results.

After a short discussion,

The President said that these inquiries were of great advantage in economizing fuel in marine and other engines, and begged to move the thanks of the section to Mr. Allen.

The motion was carried.

A New Marine Boiler.

Dr. F. Gramaldi read a paper on "A New Marine Boiler," the principle of which was that the whole boiler, which consisted of a cylinder nearly filled with tubes, was kept slowly revolving during the time of working. Detailed drawings were exhibited of a boiler of 100-horse power, which occupied less than half the space of ordinary marine boilers of the same power, and was of less than half the weight. The fire-grate, placed beneath the boiler, has the whole shell brought gradually over it, the hot gases passing through all the tubes, part of these being covered by the water and part in the steam space, thus rendering the boiler a steam generator and a superheater.

In the discussion which followed, and in which Mr. Siemens, Mr. Allen, and Mr. Scott Russell took part, the general principle of the boiler was fully approved, and it was stated that Mr. J. Stewart, of Blackwall, was about to construct one suitable for a steam vessel. The plan had been tried on land, and details of the experiments were given.

Mr. Thorold read a paper "On the Failure of the Middle Level Sluice, and the means of preserving such sluices." Mr. Thorold attributed the failure to the silty nature of the soil being too weak to withstand the great hydrostatic pressure brought against it at high tides, and he proposed to remedy and secure such sluices from the possibility of failure in future by the erection of a duplicate sluice at the back of the sea-sluice, for the purpose of keeping up a head of tidal water to a medium height between the two sluices when the sea-sluice was closed by the tide, and he showed by a diagram how this was to be accomplished, avoiding three-fourths of the usual pressure without detracting from the utility of the sea-sluice.

Mr. Vignoles, while fully approving Mr. Thorold's plan for securing such sluices, suggested that, as there was to be an excursion to the dam and syphons on Saturday next, and as there were so many questions arising out of the failure, legal and otherwise, he thought it most prudent that the discussion on Mr. Thorold's interesting paper should be deferred until Monday next, when, after having seen the site of the old sluice and dams, members would be in a better position to discuss the whole subject of failure, and the questions of dams and syphons.

Mr. Vignoles' suggestion was approved by the section.

Middle Level.

On Saturday a large party of members of the association—upwards of 90 in number, and comprising among them many of the more eminent members of Section G—made an excursion to Lynn to inspect the works which are being constructed at the Middle Level for repairing the mischief caused by the late disastrous irruption of waters. Mr. Appold, the amateur engineer, whose centrifugal pump has given him worldwide fame, projected and arranged the excursion. On arriving at the spot the party were received by Mr. Linn, the resident engineer, who, in conjunction with Mr. Appold, explained the apparently complicated arrangements so succinctly that they became perfectly intelligible to all his auditors. It appears that the waters are to be carried over a dam full 20 feet high, by means of syphons, which at low water discharge themselves into a canal connected with the sea by means of the river Ouse. Six of these siphons have already been laid and tried, and are found to answer so satisfactorily that the number is being increased to 16, which are to be completed before the end of November. They are of uniform size, 3 ft. 6 in. diameter, 150 ft. long, rising 20 ft. in a curved line, with valves at both ends, and are laid in a row 18 in. apart. At the experiment made with the first six siphons it was found that they discharged 50,000 gallons a minute—an immense advantage as well in efficacy as in the saving of expense over the usual appliance of steam pumping. For this substitution the parties interested are, it was stated, mainly indebted to the ingenuity of Mr. Appold. To set the siphons going and to pump out the air whenever it interposes, a small steam-engine has been erected, of 10-horse power, working three air-pumps, of 15 in. diameter and 18 in. stroke.

After a full hour's inspection the party returned in carriages to Lynn, where at the Duke's Head they found an elegant repast spread for them by their liberal host. After some lively speeches the party returned to Cambridge by train.

Among the company were:—Mr. Tite, Mr. H. Marsh, Mr. W. Fairbairn, Mr. James Napier, Dr. Daubeny, Mr. Scott Russell, Rev. Dr. Robinson, Mr. Charles Barry, Mr. Wollaston Blake, Mr. C. Vignoles, Mr. Charles Siemens, Mr. R. Wilkinson, Mr. Le Neve Foster, Mr. H. G. Bohn, Mr. C. White, Mr. T. Webster, Mr. C. Brooke, Mr. Robert Mylne, &c.

Mechanical Science.

This section met this morning in the schools, Mr. W. Fairbairn, LL.D., F.R.S., in the chair. There was a very numerous attendance. Among those present were Sir W. Armstrong, Sir E. Belcher, the Vice-Chancellor, Professor Robinson, Mr. Napier, Mr. Whiteside, Mr. Nasmyth, Mr. Aston, Mr. Scott Russell, &c.

Steamships.

The first paper brought before the section was the report of the Steamship Committee, of which Mr. W. Smith, C.E., gave a summary. The following is the concluding passage of this very voluminous and valuable document:—"Your committee have pleasure in reporting very satisfactory progress, and that they have now a larger amount of useful information placed at their disposal. There is much greater interest taken in the objects of the inquiry, and a still increasing number of observers have adopted the forms of the committee for recording the performances of vessels. The importance of the information collected by your committee is attracting the attention of steamship owners, as well as scientific investigators, and it is hoped the result of greater efficiency and economy in the application of steam, as well as in improvements in the construction of steam vessels, will be the results of these reports; and your committee have reason to believe that considerable advantages have already been derived from their labours by steamship owners. The committee purpose to act upon a suggestion made to them of forming a list of the engineers of the several classes employed in the mercantile steam service who have, with the sanction of their owners, supplied your committee with returns of the performances of ships under their charge, to which reference may be had by such members of your association as are interested in the subject, and with a view to afford opportunities for the advancement of such engineers as have shown the greatest amount of scientific ability in connexion with their calling. Your committee have determined to act upon a suggestion by which the performances of some steamships which are at present withheld may in future be supplied for the use of the committee—viz., that such returns shall be published under a distinguishing number, instead of publishing the name of the vessel, her builders, and the constructors of her machinery, and that the latter particulars shall only be disclosed with the consent of the owners. Your committee continue to receive, from steamship owners and engineers, invitations to be present at the trials of steamships. In conclusion, your committee believe that their labours have already

been productive of considerable advantage; that the objects with which they were appointed are being rapidly attained; and that, by continuing their labours, the machinery they have succeeded, after considerable trouble, in organizing will be productive of the utmost benefit to those engaged in steam navigation; and they have reason to believe that the future collection of the returns will be a comparatively easy task."

MECHANICAL PROPERTIES OF PROJECTILES.

The president made some observations on the results of some experiments on the "mechanical properties of projectiles." He commenced by stating that, in the investigations which had taken place with regard to projectiles and armour-plated ships, one great difficulty that had arisen was to get plates of sufficient thickness, and vessels of sufficient tonnage to carry those plates. It appeared that they were limited to plates of five inches in thickness; with plates heavier than that a ship would not be what was technically called "lively." He had attended the experiments at Shoeburyness from the commencement, and they had reference to the force of impact. He would state the results of the more recent experiments, which had not yet been published. The first series of experiments had reference to the quality of the plates and the properties of the iron best calculated to resist impact. There were three qualities required—1st, that the iron should not be crystaline; but, 2nd, that it should be of great tenacity and ductilty; and, 3rd, that it should be very fibrous. The president produced specimens of spherical and flat-ended shot, and proceeded to give the statical resistance of each.

The mean statical resistance to crushing of the two flat-ended specimens of cast iron is 55·32 tons per square inch. The mean resistance of the two round-ended specimens is 26·87 tons per square inch. The ratio of resistance, therefore, of short columns of cast iron with two flat ends to that of columns with one flat and one round end is as 55·32 to 26·87, or as 2·05 to 1—an extremely close confirmation of Professor Hodgkinson's law. Applying this same rule to the steel specimens, it would appear that the flat-ended shot would have sustained a pressure of 180 tons per square inch before fracture. In the experiment it actually sustained 120 tons per square inch without injury, excepting a small permanent set. In the experiment with cast iron the mean compression per unit of length of the flat-ended specimens was ·0,665, and of the round-ended ·1,305. The ratio of the compression of the round-ended to the flat-ended was, therefore, as 1·96 to 1, or nearly in the inversed ratio of the statical crushing pressures. Applying this law to the case of the steel flat-ended specimen, we may conclude that the compression before fracture would have been only ·058 per unit of length. The determination of the statical crushing pressure of the flat-ended steel shot as 180 tons per square inch and its compression as ·058 is important, on account of the extensive employment of shot of this material, size, and form in the experiments at Shoeburyness. In the case of the lead specimens, the compression with equal weights was the same, whether the specimen were at first round-ended or flat-ended. This is accounted for by the extreme ductility of the metal and the great amount of compression sustained. In regard to the wrought-iron specimens, it may be observed that no definite result is arrived at, except the enormous statical pressure they sustain, equivalent to 78 tons per square inch of original area, and the large permanent set they then exhibit:—

	Statical resistance in tons per square inch.	Dynamical resistance in foot lb. per square inch.
Cast-iron, flat-ended ...	55·32	776·8
Cast-iron, round-ended	26·87	821·9
Steel, round-ended ...	90·46	2,515·0

In the experiments on the wrought-iron specimens, the flat-ended steel specimen, and the lead specimens, no definite termination was arrived at, the material being more or less compressed without any fracture ensuing. Hence it is difficult to draw conclusions from these results, but the great amount of work expended in compressing the wrought-iron specimens, amounting in one case to 4,340 foot lbs., or nearly twice as much as was required to fracture the round-ended specimen of steel. On the other hand, the low statical resistance of lead corresponds with a dynamical resistance almost equally low. The work required to crush similar specimens of cast iron is nearly the same whether the ends be rounded or not, the round-ended requiring rather more work to be expended than those with flat ends. It is, therefore, obvious that there is no analogy between the law deduced for statical forces by Professor Hodgkinson and the law regulating the dynamic resistance. The mean resistance of the specimens of cast iron is 800 foot lb. per square inch; that of the specimen of steel is 2,515, or rather more three times as much. The conditions which would appear to be desirable in projectiles, in order that the greatest amount of work may be expended on the armour plate are—1st, very high statical resistance to rupture by compression. In this respect, wrought iron and steel are both superior to cast iron; in fact, the statical resistance of steel is more than three times, and that of wrought iron more than two-and-a-half times, that of cast iron. Lead is inferior to all other metals experimented on. 2nd, resistance to change of form under great pressures. In this respect hardened steel is superior to wrought iron. Cast iron is inferior to both. The shot which would effect the greatest damage to a plate would be one of adamant, incapable of change of form. Such a shot would yield up the whole of *vis viva* to the plate struck; and, so far as experiment yet proves, those projectiles which approach nearest to this condition are the most effective. (Cheers.)

The president stated that steel shots might be made at comparatively small cost. Mr. Bessemer had informed him that if he had a large order he could produce steel shot at very little more than the price of wrought iron. But if ingots as cast had to be rolled or hammered to give them fibre, they would cost something like £30, instead of £8 or £10 per ton.

The thanks of the section were given to the president for his valuable paper.

PENETRATION OF PROJECTILES.

Mr. T. Aston, M.A., read a paper on "Rifled Guns and Projectiles adapted for Attacking Armour-plates." After alluding to the interest with which the contest between artillery and armour-plates has been watched by the country, he explained what was the actual condition of this important question so late as May last by quoting a statement made by Sir W. Armstrong at a meeting of the United Service Institution on the 20th of May last, as follows:—"It certainly may be said that shells are of no avail against iron-plated ships; but, on the other hand, I may say that neither 68-pounder nor 110-pounder guns, with solid round shot, are effective against such iron vessels. The fact is, what we want is a gun, in addition to our 110-pounder rifled gun, especially adapted for breaking through iron plates. That is what we are in want of now." This candid confession is startling when it is considered that long ago France armed her Gloires and Normandies with rifled 90-pounders proved to be efficient against iron-plates, and it caused the country serious anxiety to hear Her Majesty's ministers state, as they did in Parliament last session (of course on the authority of their scientific advisers), that after all the vast expenditure upon our new artillery, the navy of England is compelled to arm her navy with the old smooth-bore, and that is the best gun the navy actually possesses, though declared by Sir. W. Armstrong to be so inefficient. Such being the state of the question a few months ago, Mr. Aston proceeded to consider, first, the reason why the artillery hitherto employed in the service (including rifled guns and smooth-bores) has always failed to make any impression on the plated defences at ordinary fighting range; and, secondly, by what means artillery science has lately reconquered its lost ground. Three conditions were laid down as necessary to enable artillery to attack successfully armour-plate defences—1st, the proper projectile must be of the proper form; 2nd, of the proper material; and 3rd, be propelled from a gun able to give it the necessary velocity. The artillery of the Ordnance Committee failed because they utterly neglected the first two conditions, and had recourse to the brute force of the smooth-bore for the third. The expression accepted as representing the penetrating power of shot was "velocity squared, multiplied by weight," but the form of the shot and the material were conditions altogether omitted from the expression, and the importance of the omission will be obvious at once if an analogous case, say a punching machine employed to perforate wrought-iron plates, be taken. What would be the result if the punch, which is made of suitable shape and material, were removed, and a round-headed poker of brittle cast-iron or soft wrought-iron were substituted in its place? The great importance of velocity was conceded at once; it is a *sine quâ non* condition, but there has been great misconception in supposing that the old smooth-bore gives a greater initial velocity than the rifled gun, as the results obtained will show. The average initial velocity of the 68-pounder is, in round numbers, 1,600 feet per second, with a charge of powder one-third the weight of the shot, the length of the shot being, of course, one calibre. Sir W. Armstrong stated that, with a charge of powder one quarter the weight of the shot, he obtained with his rifled gun an initial velocity of 1,740 feet per second. He did not state the length of his projectile. Mr. Whitworth, with a projectile two calibres long, obtains an initial velocity of 1,900 feet per second, and with a projectile one calibre long, like that of the smooth-bore, an initial velocity of 2,300 feet per second, being greater than that of the smooth-bore in the proportion of 23 to 16. The following table shows the actual results obtained by various guns:—

Gun.	Range.	Projectile.	Powder Charge.	Penetration into Armour Plate.
Armstrong 110-pounder	200	110lb. solid	14lb.	1½ to 2 inches.
68-pounder smooth-bore	200	68lb. solid	16lb.	2½ to 3 inches.
Whitworth 70-pounder	200	70lb. shot and shell	12lb.	Through plate and backing.
Whitworth 120-pounder	600	130lb. shell	25lb.	Through plate and backing.

The first two results show that the Armstrong rifled gun is a worse compromise than the old gun it was intended to supersede. It is worthy of notice, that the velocity of the Whitworth heavy projectile after traversing 600 yards (a good fighting range) was 1,260 feet, being 50 feet greater than the initial velocity of the Armstrong projectile, which is 1,210 feet at the muzzle of the gun. The total results in respect of penetration being so decidedly in favour of Whitworth, it follows that he has adopted the best compromise, by combining all three necessary conditions of proper form and material of projectile and sufficient velocity. That the velocity, though perhaps at the muzzle of the gun slightly below that of the smooth-bore, is sufficient, when combined with proper form and material of projectile, is shown by the penetration result, which in the case of the Whitworth is through and through both armour-plate and backing; in the case of the smooth-bore it is barely through half the armour-plate, and in the Armstrong is not half through. The form of projectiles, both shot and shell, employed by Mr. Whitworth for penetrating armour-plates were then described. The material of which the projectile is composed is what is termed homogeneous iron, combining the toughness of copper with the hardness of steel. It undergoes a carefully-regulated process of annealing. The same metal is used for the Whitworth field guns, and practical improvements now enable it to be worked in masses of any requisite size, whose quality may be henceforth depended upon with certainty. Mr. Whitworth is, therefore, now making his heavy ordnance with both interior tubes and outer hoops of homogeneous metal of the improved manufacture, so that the guns will be constructed throughout of one uniform metal, without any weld-

WARD'S SELF-CENTERING TURN-TABLE.

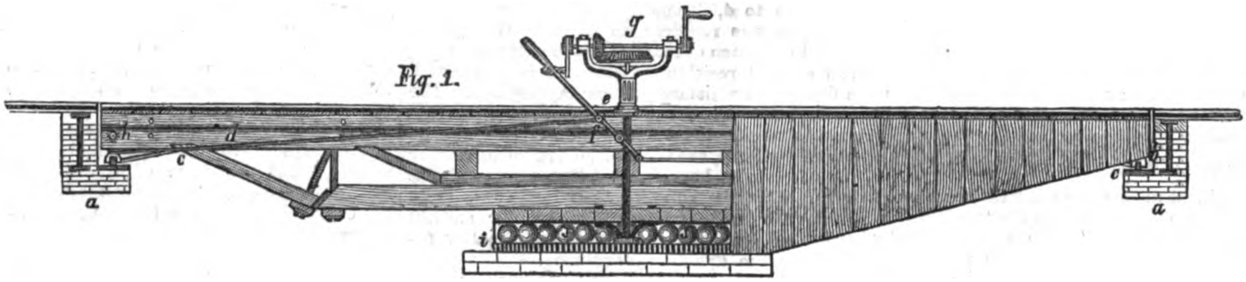


Fig. 1.

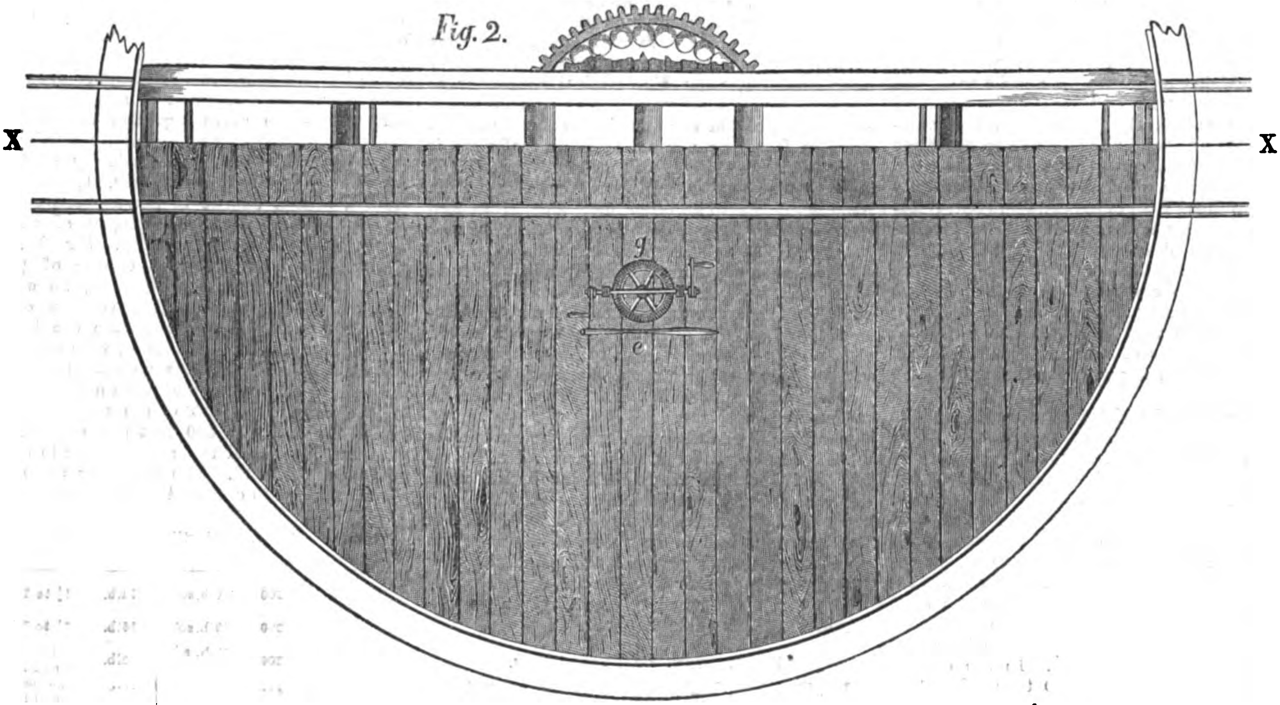


Fig. 2.

ing at all. Experience justifies the expectation that they will be free from the objections which it is well known are inherent in all welded guns, and be fully able to resist the severe and searching strain that is sure, sooner or later, to disable a gun built up of forged coiled tubes, if it be called upon to do its full work, by discharging heavy projectiles at efficient velocities.

Mr. James Nasmyth, F.R.A.S., said the steam ram was an old subject with him. A plan was proposed by him to the Admiralty so long ago as 1845. He thought the more destructive you can make the attack on your adversary the better. It was not right to be torturing your enemy by drilling numerous small holes in him; it was like taking a whole day to draw a tooth. (A laugh). His idea was to make one large hole and sink the ship at once with the enemy. (Cheers.) It was a question of *momentum*. The first practical ram was the Merrimac, but the Southerners made a mistake in giving her a sharp end—it should be blunt, and such was the original plan of the author, nor had he seen any reason to alter his views. The vessel must present as low an angle as possible to turn shot, but she must also have strength in the direction of her length, and use the utmost possible amount of steam; and, to meet the objection that the impact might destroy the engines, which he did anticipate, he would place the engines on a slide, with buffer arrangements. With such a vessel he would dash into the "Warrior" as into a bandbox. (A laugh.) The plates would be crushed at once. He hoped the Admiralty would devote a thousand pounds or two to try the effect of a ram against an old hulk, the ship "Trusty," and afterwards at the "Warrior" herself. (Cheers.)

(To be continued.)

WARD'S SELF-CENTERING TURN-TABLE.

This description of railway turn-table is rather novel, from the fact of there being no central or guiding pivot, thereby allowing the platform freedom to yield in its revolution without injury, making it capable of sustaining more weight, and cheaper in its original cost than the ordinary ones in use.

The illustrations represent an engine-table of this description, 45 feet diameter, as used in Canada, the United States, Central and South America, notices of which have from time to time appeared in our transatlantic contemporaries, and we also learn that they are being introduced on some of the principal lines diverging from London, and many continental railways, with a constant increasing demand from all parts of the world. Having witnessed the one exhibited in the north end of the eastern annexe of the International Exhibition by Messrs. Lloyds, Fosters and Co., of Wednesbury, makers, we find our convictions realized as to the merits of these tables. The one referred to seems to improve with use, and has it is said made more revolutions than any table now in use, and from all appearance is likely to continue for years without repair or injury.

Fig 1 of the accompanying illustrations represents an elevation of this description of table on the line of X X Fig. 2, and Fig. 2 represents the turning platform with half the decking removed, the truss work and covering of which are of wood.

A company has been called into existence for the formation of a new railway for North Somerset, to be called the "Bristol, North Somerset, and South Western Junction Railway Company."

RAILWAY BRIDGE OVER THE GROSS-ACHEN.

The following figures give some sketches of the railway bridge over the Gross-Achen, on the line from Munich to Salzburg, which may be looked upon as representing the standard arrangements of the details in Pauli's bridges, as manufactured by Messrs. Klett & Co., of Nürenberg, Germany.

Figs. 1 and 2 are :—view, plan, and cross section of such a structure. The tension bar (Fig. 3) consists of a number of flat irons, connected together by conical bolts, the joints being effected either by one flat iron running throughout the length of the bar for that special purpose, or by extra joint plates. If the section of the tension bar by required to be great, two tension bars, composed of flat irons, are laid side by side, for the reason that the quality in flat iron of a small section is to be more depended upon than that in large sections, and at the same time bolts of an inconvenient length are avoided.

The compression bar (Fig. 4) is generally arranged with a trunk section, and its dimensions determined proportionately for the width of the panels of the bridge. To save material as much as possible, its greatest amount is accumulated into the corners of the section. In case of very large spans, as in the Mayence Bridge, the two compression bars are firmly connected together. (Fig. 5.)

That part of the structure by which the tension and the compression bar is to be connected together, the so-called "shoe" (Fig. 6) must present an ample amount of space to do this, having at the same time strength enough to resist the tendency of shearing off over the resting point of the beam.

RAILWAY BRIDGE OVER THE GROSS-ACHEN.

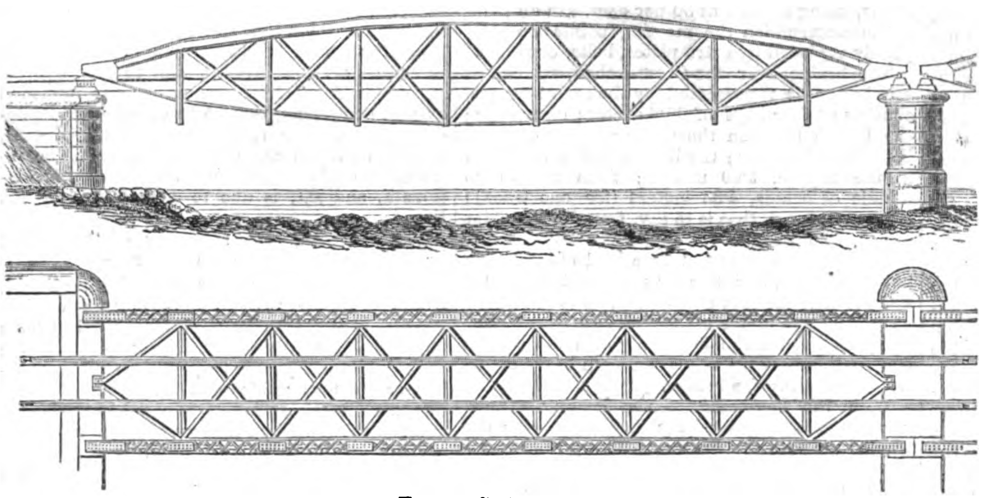


FIG. 1.—Scale 1-250.

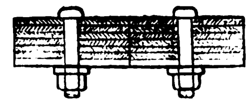


FIG. 3.—Scale 1-10.

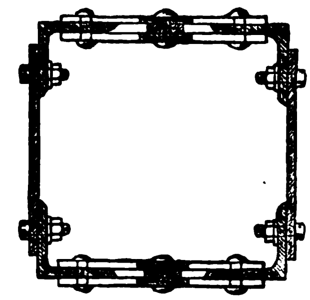


Fig. 4.—Scale 1-10.

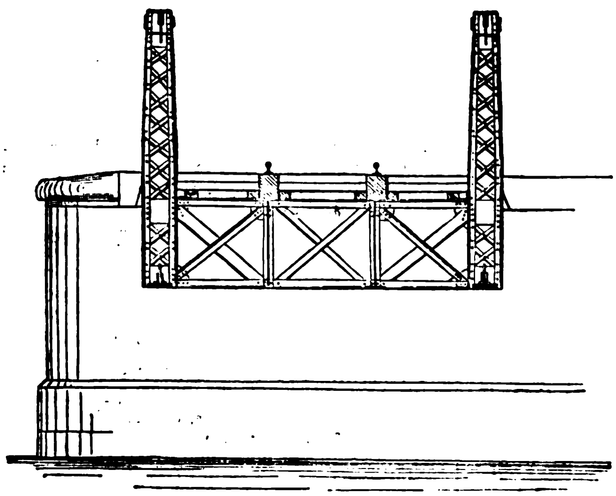


FIG. 2.—Scale 1-100.

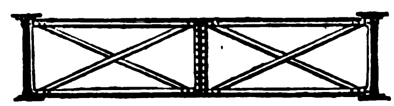


FIG. 5.—1-100.

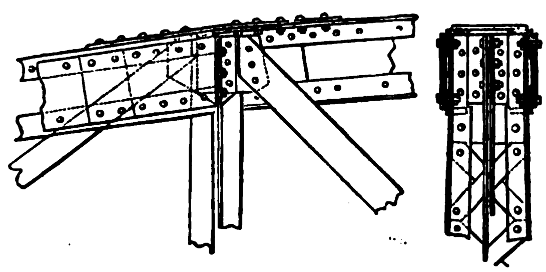


FIG. 7.—Scale 1-25.

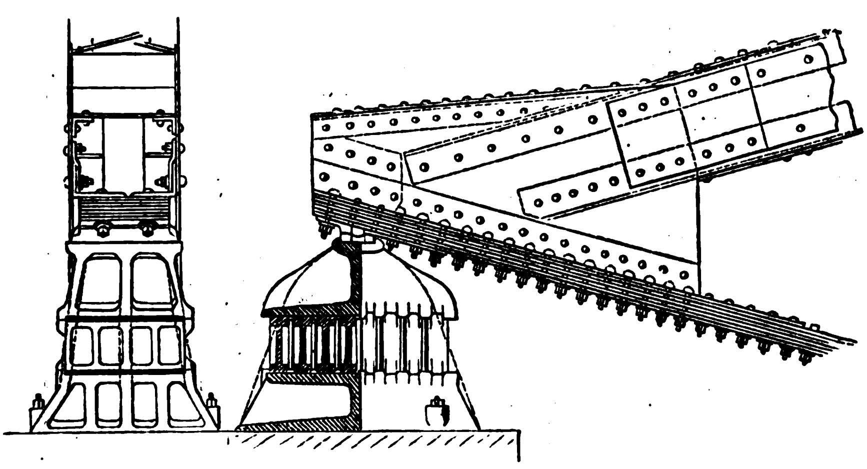


FIG. 6.—Scale 1-25.

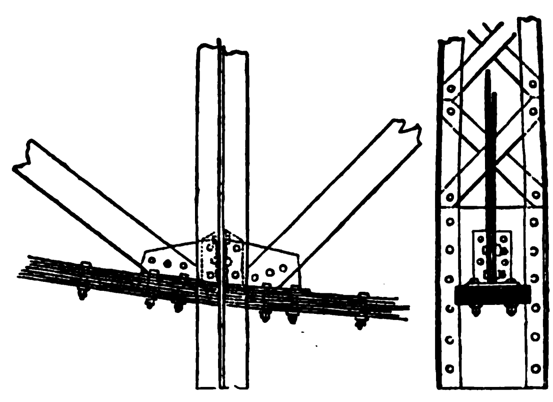


FIG. 8.—Scale 1-25.

The vertical posts are arranged of angle iron, so as to present in their sections either the "cross" or "double T" form. At the top they are attached to the compression bar by bolts, according to the forces acting upon them, and beneath they rest upon the tension bar in such a manner that no transversal movement is possible (Figs. 7 and 8).

As the girders carrying the platform are to be attached into those posts, they have, according to the position of the platform, which lies either under or over, or in the geometrical axis of the beam, to project either higher than the compressions or beneath the tension bar. By this the section of the posts, whether in the cross or double T form, is determined.

The sectional dimensions of all prismatic parts of the construction, on which compressive forces are acting upon, are determined by the formulæ

$$K^d = \frac{K_0}{1+\frac{1}{8}\cdot\frac{\omega}{\mu}\cdot\frac{K_0}{\epsilon}\lambda^2}$$ it being:—

K^d the bearing power per unit of the section.

K the maximum of working strain.

ω the area of the prism.

μ the momentum of the figure of the section.

λ the free length between the compressive forces.

The formulæ holds good till $K_0 = 1{,}000$ kilog. per square centimeter (6·46 tons per square inch).

The diagonals consist of flat irons, which are bolted at their ends to pieces of sheet iron, which are properly connected to the compression, the tension bars, and the posts. (Figs. 7 and 8.

The whole construction rests at each end by planed steel plates on cylindrical ones of great

radius. By this arrangement the beam may deflect freely, without producing a one-sided pressure of great intensity upon the supporting plates, and dispensing at the same time with wooden underlays (as used in large bridges in England, and in some instances in Switzerland). A longitudinal, as well as a transversal, dislocation of those plates is obviated by projections acting like teeth. The lower of those plates are connected to cast-iron chains (Fig. 6), one of which rests directly upon the pier, while the other stands on stilts, which allows for the longitudinal differences in length of the bridge, caused by the change of temperature. To keep the parallelism, the stilts have also projections, or teeth, which fit into like ones of the rolling chair and the bottom plate. The cylindrical faces of the stilts are turned and move on even planed ones. The stilts are used in the shape of *sections* of *cylinders*, as it is obvious that the pressure to which cylinders may be exposed increases with the diameter of them, thus saving by a greater depth in the total length of the pieces, and by that in the dimensions of the supporting plates. The dimensions of the stilts are so determined, that, for different spans, the maximum inclination, caused by the extremes of temperature, are nearly of an equal amount in the respective different spans. The pressure per unit of length is taken in proportion to the radius r, and is for cast iron, the radius being given in centimeters, equal to 12 r kilog. per centimeter run, which, within the limits in which r varies, is quite admissible.

The transverse girders carrying the platform are, in railway bridges, constructed on the triangular system. In larger spans, longitudinal extra girders are wanted to transmit the load of the platform to the points of construction of the chief beams. They lie either in the same plain with the chief beams, and carry the intermediate transverse girders, or are fixed *between* the transverse girders and carry the direct underlays of the rails. Those parts having first to take up the effects of the moving load are to be constructed of a greater relative strength, that is to say, with a smaller figure for the working strain, as in the principal beam.

The bracings are obtained by flat irons, which are bolted on at its ends only, being at the same time stretched to a certain length. The use of intermediate arrangements for the regulation of the length of those bracing ties, is objected to, considering that a well designed iron-bridge, under the ordinary traffic, always keeps its regular position, and thus an arbitrary alteration of length can do nothing but harm.

By experiments carried on at Messrs. Klett and Co.'s it was found that rolled iron has less strength in its longitudinal direction than its transversal, which has to be borne in mind in designing the positions of the bolts in joining flat iron. Thus the extreme hole is so far back from the edge that the remaining longitudinal section is as great as the area of the section of the bolt. Besides this, the relative position of the bolts is changed in such a manner that the section of the flat iron is weakened only by one hole, the oblique area between the first and second transmitting bolt being 20 per cent. larger than the transverse section in action.

The same experiments have shown, that, to obviate jolting at the edge of the hole, the bolts (or rivets) should not exceed a certain diameter for a certain thickness of the flat iron to be fastened. The limits at which this jolting takes place was found to be at a pressure of 4,300 to 6,000 kilog. per square centimeter of the bolt's face of action. The *limit of elasticity* of wrought iron being 1,600 kilog. per square centimeter (circa 10 tons per square inch) it was determined that the bolt's face in action (being the product of its diameter by the thickness of the iron to be fastened) ought never to be less than 4-10ths of the whole area of section of the bolt.

By this means the incertitude in determining the dimensions of the bolts (or rivets) to be used for a certain joint, is dispensed with. To rely with the utmost security on the complete action of the joints, the section of turned bolts are taken 20 per cent. higher than the respective effective area of the flat iron, this addition, in using hot rivets, being as high as 50 per cent. In all parts of the construction the meeting points are completely replaced by extra plates, bolts, or rivets.

The bridge over the Gross-Achen, which, as said before, is represented by the above figures, consists of four bays of 26·6 meters clear span; the length between the resting points of beam being 27·26 meters; the height of the beams is, in the middle, 3·60 meters; from middle to middle of beams, 4·83 meters (for one track); depth of girder, that is to say, from lowest point to rail, 1·50 meters.

The bridge was tested by a load of 5·14 tons per meter run, and this was effected in such a manner that the first pile of rails, up to the above weight for one meter of the bridge's length, was completed before the beginning with the second one, such having the effect of a train of the above weight entering the bridge.

With the beginning of the loading a most regular transmission of the deflection over the whole span was observed, and a very regular increase of it when the load was proceeding.

When the continuous equal loading of the structure with 5·14 tons per meter run was completed, the elastic deflections were as follows:—

Point of Construction. No.	Distance from Resting Point, No. 1, in Meters.	Observed Elastic Deflection, in Millimeters.	Calculated Deflection in Millimeters.
0	0·0	0·0	0·0
1	3·13	8·2	7·3
2	6·13	12·8	12·5
3	9·13	17·0	16·0
4	12·13	17·8	17·8
5	15·13	18·0	17·8
6	18·13	16·3	16·0
7	21·13	12·8	12·5
8	24·13	7·3	7·3
9	27·26	0·0	0·0

N.B.—25 millimeters 1 inch.

The permanent *deflection was less* than one millimeter.

THE FORM AND MOTION OF WAVES.

British Association, 1862, Section A.

Abstract of an Investigation on the Exact Form and Motion of Waves at and near the surface of Deep Water. By William John Macquorn Rankine, C.E., LL.D., F.R.S., L.S., and E., &c.

The following is a summary of the nature and results of a mathematical investigation, the details of which have been communicated to the Royal Society.

The investigations of the Astronomers Royal, and of Mr. Stokes on the question of straight-crested parallel waves in a liquid, are based on the supposition that the displacements of the particles are small compared with the length of wave. Hence it has been very generally inferred that the results of those investigations, when applied to waves in which the displacements are considerable, as compared with the length of wave, are only approximate.

In the present paper, the author proves that one of those results, viz., that in very deep water, the particles move with a uniform angular velocity in vertical circles, where radii diminish in geometrical progression with increased depth, and consequently, that surfaces of equal pressure, including the upper surface, are trochoidal, is exact for all possible displacements how great soever.

The trochoidal form of waves was first explicitly described by Mr. Scott Russell; but no demonstration of its exactly fulfilling the cinematical and dynamical conditions of the question has yet been published, so far as the author knows.

In "A Manual of Applied Mechanics" (first published in 1858), the author stated, that the theory of rolling waves might be deduced from that of the positions assumed by the surface of a mass of water revolving in a vertical plane about a horizontal axis; but as the theory of such waves was foreign to the subject of the book, he deferred until now the publication of the investigation on which that statement was founded.

Having communicated some of the leading principles of that investigation to Mr. William Froude, in April, 1862, the author was informed by that gentleman, that he had arrived independently at similar results by a similar process, although he had not published them. The introduction of proposition II. between propositions I. and III. is due to a suggestion by Mr. Froude.

The following is a summary of the leading results demonstrated in the paper:—

Proposition I.—In a mass of gravitating liquid, whose particles revolve uniformly in vertical circles, a wavy surface of trochoidal profile fulfils the conditions of uniformity of pressure; such trochoidal profile being generated by rolling, as the under side of a horizontal straight line, a circle whose radius is equal to the height of a conical pendulum that revolves in the same period with the particle of liquid.

Proposition II.—Let another surface of uniform pressure be conceived to exist indefinitely near to the first surface; then if the first surface is a surface of continuity (that is, a surface always traversing identical particles) so also is the second surface. (Those surfaces contain between them a continuous layer of liquid.)

Corollary.—The surfaces of uniform pressure are identical with surfaces of continuity throughout the whole mass of liquid.

Proposition III.—The profile of the lower surface of the layer referred to in Proposition II. is a trochoid generated by a rolling circle of the same radius with that which generates the upper surface; and the tracing arm of the second trochoid is shorter than than of the first trochoid by a quantity bearing the same proportion to the depth of the centre of the second rolling circle below the centre of the first rolling circle, which the tracing arm of the first rolling circle bears to the radius of that circle.

Corollaries.—The profiles of the surfaces of uniform pressure, and of continuity, form an indefinite series of trochoids, described by equal rolling circles, rolling with equal speed below an indefinite series of horizontal straight lines. The tracing arms of those circles (each of which arms is the radius of the circular orbits of the particles contained in the trochoidal surface which it traces) diminish in geometrical progression, with a uniform increase of the vertical depth at which the centre of the rolling circle is situated. The preceding propositions agree with the existing theory, except that they are more comprehensive, being applicable to large as well as to small displacements.

The following proposition is new:—

Proposition IV.—The centres of the orbits of the particles in a given surface of equal pressure stand at a higher level than the same particles do when the liquid is still, by a height which is a third proportional to the diameter of the rolling circle and the length of the tracing arm (or radius of the orbits of the particles), and which is equal to the height due to the velocity of revolution of the particles.

Corollaries.—The mechanical energy of a wave is half actual and half potential; half being due to motion and half to elevation.

The crests of the waves rise higher above the level of still water than their hollows fall below it; and the difference between the elevation of the crest and the depression of the hollow is double of the quantity mentioned in Proposition IV.

The hydrostatic pressure at each individual particle during the wave-motion is the same as if the liquid were still.

Friction between a Wave and a Wave-shaped Solid.

In an appendix to the paper is given the investigation of the problem, to find approximately the amount of the pressure required to overcome the friction between a trochoidal wave-surface, and a wave-shaped solid in contact with

it. The application of the result of this investigation to the resistance of ships was explained in a paper read to the British Association in 1861, and published in various engineering journals in October of that year. The following is the most convenient of the formulæ arrived at:—Let w be the heaviness of the liquid; f, the coefficient of friction; g, gravity; v, the velocity of advance of the solid; L, its length, being that of a wave; z, the breadth of the surface of contact of the solid and liquid; B, the greatest angle of obliquity of that surface to the direction of advance of the solid; P, the force required to overcome the friction; then

$$P = \frac{f\,w\,v^2}{2g} L\,z\,(1 + 4 \sin.^2 B + \sin.^4 B.$$

In ordinary cases, the value of f for water sliding over painted iron is ·0036. The quantity $L\,z$ $(1 + 4 \sin^2 B + \sin^4 B)$ is what has been called the "augmented surface." In practice $\sin^4 B$ may in general be neglected, as being so small as to be unimportant.

W. J. M. R.

Glasgow, 30th September, 1862.

Correspondence.

[*We do not hold ourselves responsible for the opinions of our Correspondents.*]

ATLANTIC TELEGRAPH.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—On receiving my monthly part of the MECHANICS' MAGAZINE, I perceived in the "Engineering Summary" of September 12th, in a notice respecting the late sounding cruize of H.M.S. "Porcupine," the following remarks:—"The 'Porcupine' has returned, and a fragment of a side wind report has appeared in the *Times*. This report, which will be found in another column, says: &c., &c.—This is an absurd statement, and rests, we believe, upon no better or more solid opinion than that of an officer, who, notwithstanding that by lecturing and otherwise he had prejudged the case, and shown himself a partisan of the Arctic or North Atlantic scheme, before the Admiralty had complied with the request of the original Atlantic Telegraph Company, was yet permitted to accompany the expedition, &c."

If I be the officer alluded to, I must, in justice, ask you to insert a few words respecting them. Fortunately, the "sidewind" report in the *Times* bears internal evidence of its not being written by any officer of the ship, but it may be satisfactory to state that neither directly or indirectly did the paragraph alluded to proceed from me; as you may be aware that officers on full pay are not allowed to communicate to the newspapers the movements or proceedings of any of H.M. ships, and although an erroneous report (as the one quoted partially is) may appear, the same order prevents an officer correcting that report. Neither am I answerable for the opinions contained therein. Your article would lead a person to believe that I had been about lecturing as a partisan of the proposed North Atlantic Telegraph Route, whereas (at the request of some friends) I have delivered but *one* lecture, and that but once, on the subject of "Ocean Telegraphy," and in that lecture gave no *electrical* opinion (if I may so call it) on either line of telegraph, but studiously avoided doing so; I merely gave my own opinion, *as a seaman*, on the best form of cable for ocean telegraphy in respect to coiling on board ship and paying out safely, *allowing the electrical conditions are perfect*, and made use of the words "sailor's cable," and on which I conceive I can give an opinion. As to being "permitted to accompany the expedition," I was simply ordered—and obeyed. And now, Sir, if not trespassing too much on your space, I will make a few remarks on the subject of telegraphic communication with America, and also answer one or two observations of Mr. Saward's on the published extract of my lecture, and which I did not see till so long after they were published that I did not consider them worth answering. I regret one error I fell into (on the information of one who should have known better); it was that the American company, represented by Mr. Cyrus Field, had received £70,000 for permission to land the cable at Newfoundland, whereas it was £75,000, in shares, &c.; had I said they were to receive great advantages, I should have been correct.

I think that any impartial person will perceive that the case of Mr. C. Field obtaining the concession from the Newfoundland government for the sole right to land a cable on their shores, is somewhat different from that of Colonel Shaffner and the Danish lands. In the former there is no want of money, enterprise, or commercial interest to prevent England carrying a cable to her colony, and thence (by mutual company) to the United States, but all those elements are wanting in Denmark. There was no doubt of the practicability of landing a cable in Ireland or Newfoundland, but that had to be proved in the Northern Route, and involved great preliminary expenses (which might all be sunk), and which expense the promoters of that route have already incurred, so that I do not think Mr. Saward is just in his comparison, although I by no means advocate that such concessions are good.

There is no doubt but that *the* great argument in favour of the Northern Route is the short submarine sections (although I have never seen those rightly stated in print); if they be no object, why not carry the cable at once to New York? Mr. Thomas Allan proposes longer lengths than from Ireland to Newfoundland, but electricians are not united in opinion. Some say that the retardation or inductive action increases in proportion to the square of the distance (and the experiments of Professor Hughes on the Red Sea cable would warrant us in believing that it is so). If that be true, would they not prefer the short sections? There can be no doubt that the risk, damage, &c., is considerably less in the short lengths, and no one will question that in case of loss it is better to lose a part than the whole. There is also a wide difference of opinion in electricians even as to the number of words that can be transmitted by the direct route: eight to sixteen per minute is wide, but even granting twelve (the mean), I may be permitted to doubt that it will ever transmit that number. There was such a vast difference between the promise and performance of the last cable, that, without prejudging the case at all, I may doubt if their expectations will ever be realized—it remains to be proved, and if another cable be laid, I shall be glad to know they can get an average of six words a minute (after it has been in working order a year), aad as many more as they can.

A few words with regard to the nature of the cable most advisable for an ocean telegraph, on which point I do think I may venture to offer an opinion. I have consulted several brother seamen on the subject, and they all concur in the reasonableness of a moderately light one as being that least liable to damage, and best adapted for stowing and paying out. There are several objections to iron-covered cables, which I submit:—1st. Their enormous weight, when placed on board a ship, deepens her to danger, and, as in the "Agamemnon," not only is the cable in danger, but the ship and the lives therein; and it is equally bad when it is paid out,—coals and provisions expended, the ship becomes like a haystack on the water, and a gale of wind and a lee shore would again risk cable, ship, and lives.—2nd. All iron-covered cables require breaks to check them in running out, or, if allowed to run, will take so much per-centage of slack as to be of importance, and in the case of the direct route to Newfoundland, I fully believe that a slack of 10 per cent., with a light cable, will be quite sufficient, thus saving upwards of 10 per cent. and nearly 200 miles of cable—making the entire cable length 1,800 instead of 2,000 miles.—3rd. The probability of injury by superincumbent weight to the heavy cable. I paid a visit to both the "Agamemnon" and "Niagara," and on board the latter witnessed the coiling of the cable, and it then struck me that the lowest sheave of the coil must be very liable to injury by the weight above it, especially if from the motion of the ship the coil ever moved.*—4th. A cable covered spirally with iron is liable to kink, and although it may not kink in paying out, it is quite possible it may do so when slack and under water. Some time since I saw in the papers that another cable was *submitted* to be laid between Ireland and Newfoundland by Messrs. Glass, Elliott & Co., which they proposed covering with coated strands of iron, and that "water tanks will be provided on board ship," for it to remain in. This plan appears to me only to add to the weight, already too great for the ship. The question whether the outer covering of iron wire is a source of strength or weakness may well be argued, and I believe myself it does not add to the strength—*ergo*, it is a source of weakness. I grant that on shore, with a steady purchase, it may prove very strong, and bear an enormous strain, but the conditions are very much altered when paid out from a ship, and the cable having been subjected to the break, and passing over wheels of small diameter, after leaving which it could not bear the strain it formerly did. It is all very well to say its weight is so much in the air and only so much in the water, but let there be a hitch in paying out, a kink, or a heavy send of the ship in a seaway, and all those calculations are useless. As to the iron wires being a protection to the cable when submerged, I do not think it is. Abrasion, I do not believe in in the ocean depths, and as a protection from insects it can be none, as you have only to bend a piece of an iron-covered cable and you will immediately perceive the strands will open quite sufficiently to allow insects to get to the gutta-percha within. The arguments in favour of a light cable are simply—its adaptability for stowage on board a ship without danger of deepening her too much, thus lessening the risk to cable, ship, and lives—the facility with which it can be handled and paid out without check or break, and, if properly constructed, is not so liable to kink as the iron-covered ones. I have seen three cables that I consider well suited for laying in the deep ocean, but of their electrical properties (as I said before) I give no opinion; indeed, I have been told that one is quite inadmissable, and I also beg to remark that I have not seen all (during a short visit to the International Exhibition I searched for them, and could find but few, and those scattered in various parts of the building, and I think it a great pity that the various inventions of telegraphic cables were not placed together). The three I allude to are Mr. T. Allan's, Mr. Hearder's, and Mr. Seimens's, and I perfectly believe that the chances of laying one of those in safety, and uninjured, would be considerably greater than any iron-covered ones, and I can only hope that if the directors of the old company determine to lay another cable they will hesitate to use a heavy iron-covered cable; at all events, that they will consult those who have to stow it in (and pay it out of) a ship; in fact in everything connected with the sailoring part of the business, before they commit themselves to one form of cable or another. As far as any personal feeling in the route of a Transatlantic cable (which would be of little consequence one way or another) I have none. The arguments in favour of the Northern Route are common, many others believe it is the best. Its practicability is, I believe, set at rest (at least as far as Greenland, to which point I have examined it myself), and the strongest argument that Mr. Saward can bring against it is that it would not do to have it under the influence or in the hands or lands of so weak a nation as Denmark. If that relate to the safety of the cable, I can assure him I could much more easily pick up the bight of his cable off the coast of Ireland or Newfoundland, than one on any of the coasts to which it would be taken on the Northern Route. Most pleased shall I be to see another "direct" cable laid, and I sincerely hope it may succeed, but without it does to the extent of the expectations of the electricians, I shall still hope to see one laid on the Northern Route; there is room and requirements for both, and more, without rivalry.

In the event of the cable being laid, and the proceedings of the cable from its cradle to its grave, and its working afterwards, be published by authority for the information of the public, I trust that at least we may rely on what we read, for it is very unsatisfactory to be enthusiastic on hearing that the Queen's message is delivered in so many minutes, and that "the directors are on their way to open the cable to the public," and find out afterwards that the former took many hours, and the latter did not open at all, and yet no one to blame or to be made answerable for putting forth such statements. I believe, sir, that such acts as this—a want of straightforward truthful statements, is a greater bar to the progress of a second attempt than anything I or others can write against it.

I am, Sir,
Yours obediently,
J. E. DAVIS, R.N.

* I have lately sent Sir C. Bright a plan for coiling cables, on flying platforms, to avoid such injury, and which, if worth his attention, he can use for the direct or any other line of ocean telegraph he pleases.

FLUID RESISTANCE.

SIR,—I have read from week to week the discussion going on in your paper respecting the various forms of water-line for a ship's bow—the convex, the hollow or wave, and the straight—each having an advocate in one or other of your correspondents, who endeavours to prove his own view to be correct. This subject among naval architects is well known

to be a much-vexed question, and one in which there are many apparent anomalies; and instances can, I have no doubt, be shown, as is stated by your correspondent "Nauticus," that filling the hollow in a vessel's bow has increased her sailing qualities, while it is a known fact that many of our fastest vessels, as at present constructed, particularly for smooth water, have hollow horizontal lines forward. Again, it is a law in mechanics, that lengthening or extending a wedge increases its penetrating force; and it might be supposed from this, when applied to naval construction, that lengthening the water-lines of a ship's bow would necessarily diminish resistance and increase her speed; but this is not always so, unless judiciously performed. I have before me the model of an old-fashioned Baltimore clipper, with a full round bow (bought many years ago by the late Earl of Wilton, I believe, for her fast-sailing qualities as a yacht) in which this was done. She was brought to England and lengthened some feet by the bow, and her sailing qualities were found to be gone. This may appear singular, but may be explained without violating any mechanical principle. The "America" schooner-yacht, on the other hand—an improvement on the old Baltimore clippers, and famous for her speed—has fine hollow water-lines and a sharp tapering bow; but again, the yacht "Arrow," built many years ago with a full bow, very much like the Baltimore clipper above referred to, I have seen sail and hold her own well with, and very nearly beat, such yachts as the "Musquito," with a sharp hollow bow, and noted for great speed.

From this it is evident that, although the form of the horizontal or water lines doubtless greatly influence the speed of a vessel, there must yet be some other influence at work to produce such apparently contradictory results. Such an influence is to be found in the formation of the vertical longitudinal sections of the bow, known to naval constructors as the bow-lines, and considered by some only of use as means of keeping the bow fair.

When, however, it is remembered that water presses equally on all sides, and, practically speaking, is a fluid of equal density, at least for the depth at which a ship would float, it is evident that its particles rise and fall with the least disturbance, and not only take a horizontal direction past the ship, as is the case with any sensibly lighter floating body, but also a vertical direction under the bottom, and I have no doubt also pass off along lines at any angle between the two; but in designing a vessel of the horizontal sections or water lines, and the vertical sections or bow lines are made as fine as the service for which the vessel is intended will admit, the form of any diagonal lines between the two will follow.

The form of the bow lines was evidently considered in the construction of the old Baltimore clipper, and good speed was attained, although with a full load water line. When lengthened by the bow, the horizontal resistance was lessened, but not so much as the vertical resistance was increased, and consequently the loss of speed. In the "America" both the vertical and horizontal lines are carefully formed, and consequently a very fast vessel is the result. In the vessel in which the hollow in the bow was filled and the speed increased, as instanced by your correspondent "Nauticus," the effect would be not only to increase the stability and canvas-carrying power, but also to lengthen the bow lines, diminishing the vertical resistance, and so increasing speed.

In the case of the "Pysche," referred to by your correspondent, Mr. Moy, it is evident from the heaping up the water before her bows, not that probably the horizontal lines are so very defective, as that the vertical lines are so full as not to admit of a due proportion of the particles of water passing under the ships' bottom. In illustration of this, let anyone observe a Thames sailing lighter, with a square projecting bow, the water line of which is nearly as broad immediately forward as midships, and perfectly angular, many of which, with a good wind, I have seen sail as fast as craft with a very respectable-looking water line, and certainly heap little or no water at the bows.

This is in consequence of the slanting bow diminishing the vertical resistance, and allowing the water to pass, in a great measure under the bottom. The heaping of water at a vessel's bow, is one great evidence that the form of the vertical lines have not been properly attended to, and shows an undue amount of resistance. A vessel with moderately-fine vertical lines never does this. With regard, however, to the best form of water line to be adopted—I am speaking only of the bow—even when the vertical lines are made as fine as is consistent, I would remark that it must depend on the service for which the vessel is intended, but of course this must be a matter of opinion and experience. Still an opinion with a reason, is better than one without. For sailing vessels and sea-going steamers, I should prefer the load water line to be slightly round or convex, because it both increases the canvas-carrying power, and adds to the length of the vertical bow lines; the fine bow lines will naturally give hollow water lines below. The convex water line also admits of the centre of gravity of displacement being kept slightly before the centre of the load water line, and of a proper adjustment of the fore and after bodies of the ship, for I cannot agree with Mr. Moy, when he says a vessel is none the worse for having the buoyancy brought aft, for unless the bodies are properly adjusted, she will pitch in a seaway, and will lose far more from this than she gains (even allowing it to be a gain) by a hollow load line. For a steam vessel, however, constructed only for smooth water, a slightly-hollow load line may, in long vessels, be used with advantage; but I certainly do not think the form adapted for a seaway. I will give an instance of this. A friend of mine, in crossing, a year or two ago, from Dieppe to Newhaven, in the "Orleans" (one of the boats referred to by Mr. Moy as of great speed), encountered in her passage rather a strong wind and a moderate sea, but nothing unusual for the Channel in autumn, when the boat was found to lift but very little to the seas, and she was obliged to put out some of her fires, and work across with but one engine, for fear of driving her bows under, the water being at one time nearly knee-deep on deck, forward.

Here is an instance when a fuller bow would have made a faster ship. Had she not have been so sharp in the bows the engines might both have been worked, and the passage made in less time.

I have brought forward some of these examples to endeavour to show that similar effects may be produced by apparently most opposite causes, and that the good qualities of a vessel cannot be judged of by the excellence of any one particular feature, but must be estimated as a whole. The effect of a fine horizontal line is neutralized if the vertical resistance be great, or if the fore and aft bodies be not properly adjusted, and the ship pitches in a seaway. No ship can be said to be properly designed that has any one feature, however good in itself, too prominently developed at the expense of some other good quality. The nearest approach to perfection in naval architecture is attained in that ship in which all are carefully considered, and, by a species of compromise, made to give place to each other. In the above remarks, the bow has only been treated of, but attention to the form of the after body is of nearly equal importance.

I am, Sir, your obedient servant,

John C. Martin.

Barnes, S.W., Sept. 29, 1862.

GLACIER PHENOMENA.

Sir,—In discussing a theory propounded by Professor Tyndall (but originating, it is said, with another learned gentleman) a subsequent correspondent has started a difficulty that appears to me wholly imaginary. He objects to the idea of the greater extent of glaciers in former days having been due to greater elevation of surface, that such elevation would require to be fully three-quarters of a mile, *i.e.*, about 4,000 feet. But what of that? There are still existent mountains that are not merely 4 but 14,000 feet higher than the average of Alpine peaks (ranging from 11 to 15,000 feet), so there can be nothing at all unreasonable in the hypothesis that the whole area of modern Switzerland was formerly occupied by a plateau of 16 or even 20,000 feet elevation, the space comprised between the Jura and the Alps affording ample base for such a plateau.

The more assailable point of the Professor's speculations would appear to be the assertion that the present valleys were not merely deepened and increased, but positively originated by the action of glaciers. If such a plateau as we have supposed were not originally intersected by chasms and ravines, *i.e.*, if it were a level and unbroken surface, the effect of glaciers moving over it would merely be to wear it down equally, horizontally, still level and unbroken. It is only where a hollow or a cleft already existed that the abrading action, whether of water or of ice, would tend to be greater at one place than at another, and thus to increase the inequality of surface.

With this modification, however, the Professor's theory might stand. If he concede that the valleys originated in rents of the surface due to the force of elevation, there can be little doubt of general assent to the further proposition that they have been enlarged to their present dimensions more by the action of ice than of water.

But there is another point, on which it is impossible to justify the Professor, and which appears to have been dimly perceived by your correspondent, though he does not put it in words, viz:—that the phenomena of Switzerland should not be considered alone, but rather in connection with neighbouring countries. Were Switzerland the only spot presenting signs of much greater glacial action in former epochs, it might fairly be explained by the hypothesis of local elevation. As, however, such signs are common to the greater part of Europe, your correspondent is quite correct in hinting (for he does not *say* it), that it behoves us to seek some more general cause; and the hypothesis he throws out regarding the Gulf stream is deserving of scientific consideration. It is undoubted that the milder temperature of Western Europe is mainly owing to this current: and, further, that the course of the current is entirely regulated by the conformation of the land forming the coasts and bottom of the Atlantic Ocean. We also know positively that this conformation has varied at sundry geological epochs, and it is quite conceivable that at the glacial period it was so different from the present, that the heated waters of the Western tropics were *not* then, as they are now, reflected round to the shores of Europe. But it is not conceivable to anyone acquainted with the topography of Central America, that the vast barrier of the Andes should have been "broken down" and re-erected as he imagined. From the extreme north of the Rocky Mountains to the south of Peru (if not farther) this range is obviously the result of one vast contemporaneous crack or fissure in the earth's crust, and all subsidence or elevation that has since occurred has been on a comparatively small scale. It would, therefore, be necessary to investigate geologically the relative dates of the elevation of the Andes and the glacial period in Europe. If the former should prove to be antecedent to the latter, your correspondent's idea regarding the course of the Gulf stream would be untenable; it would still, however, remain possible that the current should at that time have continued its course due north, along the coast of North America to the Polar basin, where signs are rife of a former temperature more genial than the present; or it is further possible that the outline of land and water was then so different that no Gulf stream existed.

If it were allowable to throw out fanciful conjectures, I would refer to the ancient traditions of Atlantis, &c., as indicating that an enormous subsidence may have taken place in the Atlantic within a recent (geological) period; so that modern Europe was previously the centre of a vast continent, which is well known to increase the rigour of climate. At any rate, it would be worth while for the professors studying the glacial period, to extend their views beyond Switzeland; and this hint regarding the Gulf stream may be worth, of grave consideration

Your obedient servant,

Viator.

SMOOTH-BORED AND RIFLED CANNON.

Sir,—Permit me to call attention to the report in the *Times* of experiments with the Horsfall and Whitworth guns, where it is said that a shot from Armstrong's rifled gun retains its initial velocity up to 2,500 yards of flight, and this extraordinary assertion is again repeated in a leading article on the subject in the *Times* of the 18th inst. As this must surely be a mistake, and as the public who pay for these wonderful guns may be misled thereby, I venture to show that such a result is an impossibility.

The statement is, that the velocity of a shot when leaving Armstrong's gun is 1,150 feet per second, and that it retains this rate of motion until a range of 2,000 or 2,500 yards is attained. Now if this be true, the shot at the end of 2,500 yards' flight, possessing undiminished speed, must have the same momentum as it had the moment of leaving the gun, and as this momentum carried it 2,500 yards, and the shot being as lively as ever at the end of this flight, it necessarily follows, the projectile can go another 2,500 yards under the same condition, nay, any number of spaces of an equal length, until gravity brings it to the ground. But, as a matter of fact, is there any proof that a shot from Armstrong's guns maintains its initial velocity for 2,500 yards? I believe there is none.

SIR CHARLES BRIGHT'S IMPROVEMENTS IN ELECTRIC TELEGRAPHS.—(*See page* 221.)

FIG. 1.

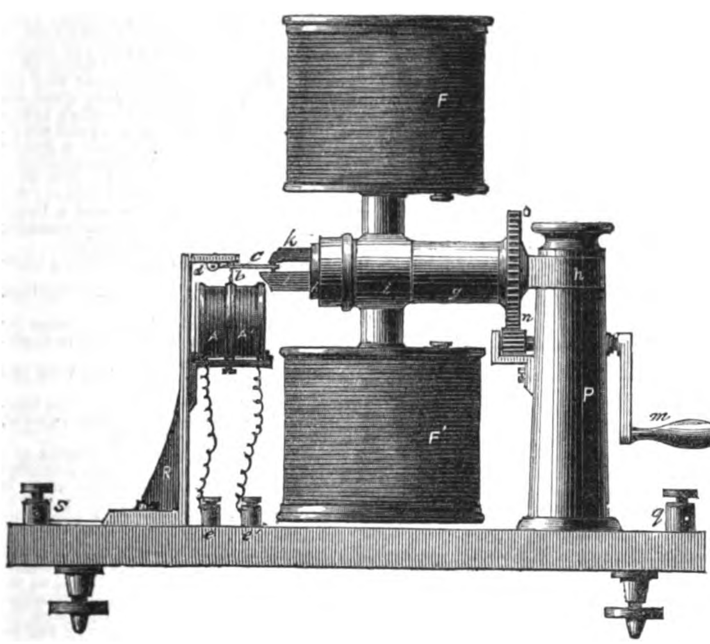
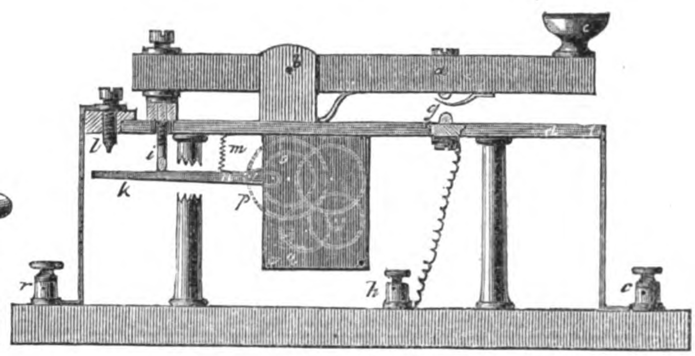


FIG. 2.



As a matter of theory, it is impossible that such is the case; for whatever is the size or shape of a shot, or the quantity of powder with which it is propelled, its velocity on leaving the gun is maximum speed, and it goes slower and slower to the end of its flight. There is no living power within it, as in a rocket, to force it onward. The impact of the powder on the shot ceases the moment it leaves the gun, and from this moment the resistance of the air opposes the onward progress of the shot; and how great a retardation this effects has been shown by Robins in his admirable treatise on gunnery, who there states that a leaden ball of three-quarters of an inch in diameter, issuing from the muzzle of a gun with the velocity of 1,670 ft. per second, loses 125 ft. per second of its speed in passing through only 50 ft. of air.

What, then, must be the loss of velocity of a shot four inches in diameter, and passing through 6,000 feet (2,000 yards) of air? It is enormous, as is proved by the difference between the initial velocity of a round shot, say 1,600 feet per second, and its final velocity, often only 450 feet per second. I think, therefore, it is clear that the resistance offered by the atmosphere to the flight of a shot at high velocities through it is so great as to produce a very large amount of retardation of the ball's speed, even at short ranges; and I repeat, that it is absolutely impossible, whatever may be the size or shape of Sir Wm. Armstrong's shot, for it to continue a flight of 2,500 yards at the same speed at which it left the gun's mouth.

And I think it will ever be found that atmospheric resistance will in long ranges so retard shot, that armoured ships will be invulnerable at ranges exceeding 400 or 500 yards, except to shot of more than 300 lb weight. Whitworth's gun appears to have done well, but as yet there is no proof that it will penetrate a five-inch plate of first-rate quality at any considerable range. The best experiments with it at Shoeburyness are of no value, the plates being bad; and from the peculiar construction of Whitworth's shot, I fear it would jam in the gun when this became heated by repeated firing. I have seen numerous experiments with this cannon, but the firing ceased before the gun had time to become hot. The importance of large guns is daily becoming proved, and I will again revert to the subject, showing how such guns can be made of less weight and handier construction than they are at present.

MARTYN ROBERTS.

Pendarren House, near Crickhowell.

THE WAVE LINE.

SIR,—Will you allow me a short space, to contradict the statement of your correspondent "Nauticus," about the yacht "America." He says that her load line has scarcely more concavity than would be sufficient to break in the straight line of the stem to the convex line of her bow without an angle at the "head ends." Just as if the *load water line* is to be a wave line. Perhaps "Nauticus" would like the deck line to be a wave line. The bow and stem of the "America" are both perfect wave bodies, and if "Nauticus" will try about 6 ft. below the load line, he will find as beautiful a wave of translation and a wave of oscillation as possibly can be constructed.

"Nauticus" would alter his opinion about Mr. Scott Russell's wave line if he only knew how to *apply it*.—Your's, very obediently,

J. QUART.

7, Amersham-vale, New-cross.

Gossip.

Two of the 100-pounder Armstrong guns for the naval service were subjected to proof on the 2nd inst., at the Royal Arsenal practice range, and both guns burst with a charge of 27½ lb. of powder, the inner tubes being completely rent directly behind the trunnions. Another 100-pounder, recently tested, also burst in the centre of the chace transversely, immediately across the barrel. These disasters are said by some practical men to be connected with the system of piece-work adopted in the gun factories, and it is stated that the work is in consequence hurried over. Sir William was never yet without an excuse for the failure of his guns. The excuse now is that the men have scamped their work. Two 200-pounder muzzle-loading guns, manufactured at Sir W. Armstrong's factory, Elswick, arrived at the Royal Arsenal on the 2nd to be tested at the practice range, and a 300-pounder on the same principle.

The petroleum controversy in Liverpool has been diversified by an invention which, it is stated, will both prevent the oil from exploding and from giving out a nauseous odour. The invention is simply a metal cask, perfectly air-tight, and therefore likely to answer the double purpose above stated. It has obtained the approval of those interested in the matter.

The Madrid journals mention the construction of a Spanish iron-clad, which they style a marvel. According to them, this monster of the deep surpasses anything as yet possessed of this kind by England or France; and they boast that early next year the Spanish flag will float over the best iron-plated ship yet launched.

A prospectus has been issued of the Universal Club and Permanent Exposition Company, with a capital of £100,000 in shares of £5 each. The proposal is to establish a permanent mart in London for the exhibition of samples, patterns, and models, and to secure for the purpose certain premises in Cannon-street which are considered to be peculiarly eligible. Exhibitors paying an annual rent for space are to be afforded also many of the usual services of a club, and an advantage in terms is to be given according to priority of application. The first 1,000 subscribers are to pay £20 per annum, the second £25, and all others £30. Extensive promises of support are stated to have been received from French and other manufacturers. The locality of Canon-street, as a great centre of the railway traffic to the city, seems the best that could be selected for such an undertaking.

Mr. H. Redsull, of Deal, has invented a submarine gun and port, a plan of which has been submitted to the Lords Commissioners of the Admiralty. The chief feature of the invention is to allow the barrel of a gun to be forced through the port, in order that a shot may be discharged from it to pierce vessels below the water line and iron coating when in close action, without taking in water at the port. It is calculated that a vessel fitted with this invention will be able to sink the Warrior or Monitor in a few seconds. The expense of fitting vessels will be very moderate, as it is contrived that almost any piece of ordnance may be used at the submarine port.

An interesting experiment was recently made on the Seine, opposite to the Palace of St. Cloud. A bridge was thrown across the river, in its widest part, within the short space of 20 minutes. This operation, which was formerly considered to be one of the most difficult in the presence of an enemy, is now accomplished with comparative facility. The bridge thrown over the Seine within so short a time on Thursday was sufficiently solid to permit infantry, cavalry, and artillery to cross the river.

T. M. says not one of the "Wave-line" disputants in his letters makes any difference between sailing vessels *on a wind* and the same running before it. When a vessel is on a wind the lee bow is pressing against the water sideways, as it were, whilst the weather bow may be said to be retreating from the water. In running before the wind the pressure is the same on both bows. In a steamer, also, the pressure on both bows is equal in 999 cases out of 1,000. May not this have something to do with the merits and demerits of the wave-line theory? If so, we may say to these gentlemen, in the words of the chameleon:—

"You both are right and both are wrong."

I think the anathematizing captain must have been smarting under a series of head winds, and had been on one tack for a length of time.

A few days since an experimental trial was made at Spithead of an invention, by Mr. H. D. P. Cunningham, R.N., for protecting the screw-propeller of men-of-war steamers from being fouled by floating wreckage or gear of any kind liable to be drawn by the current towards the screw. The trial was made under the direction of Commander Miller of,

her Majesty's ship "Asia," and other officials. The screw and protector invented by Mr. Cunningham were fitted to a small schooner-yacht, the property of the inventor. The yacht was towed astern of the "Swinger" gunboat, the screw of the schooner being kept working. A quantity of loose spars, rope, and other gear was then thrown overboard from the "Swinger," and the yacht so managed as to place the screw and apparatus under every possible disadvantage, with the view of fully testing the system. Every endeavour, however, to foul the screw with loose gear failed. The apparatus is most simple, consisting of iron bars projecting from the sternpost and netting, the whole of which, when not in use, lies close to the ship's quarter. The screw-protector will form a valuable auxiliary to the screw under circumstances of difficulty, as regards wreckage and floating masses likely to disable the propeller.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

The Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the Proprietors of this Magazine. Other Papers are hereby warned not to produce them without an acknowledgement:—

Steam Engines, 726.
Boilers and Furnaces, 710.
Roads and Vehicles, 694, 709, 712, 719.
Ships and Boats, 695, 730, 732.
Cultivation of the Soil, 707, 718, 736.
Food and Beverages, 724.
Fibrous Fabrics, 725, 739, 749, 750, 752, 758.
Buildings and Building Materials, 702, 717, 720, 751.
Lighting, Heating, and Ventilation, 692, 699, 705, 715, 731, 744.
Furniture and Apparel, 693, 696, 703, 711, 713, 716, 723, 728, 729, 737, 740, 741, 753, 757.
Metals, 704, 763.
Chemistry and Photography, 700, 735, 742.
Electrical Apparatus, 708, 749.
Warfare, 697, 743.
Letter-Press Printing,
Miscellaneous, 691, 698, 701, 706, 714, 721, 722, 727, 733, 734, 738, 745, 746, 748, 754, 755, 756, 759.

691. M. Henry. *Improvements in stuffing boxes.* (A communication.) Dated March 13, 1862.

This relates to a previous patent, dated Nov. 22, 1861, No. 2,940, and which mainly consisted in the use of a movable box or tube, or a tubular piece, or a block, or piece having a passage bored or formed through it, such box, tube, piece, or block surrounding the piston-rod or other article to which it was to be applied, and partaking of the play or wabbling motion thereof, and the box, tube, or piece (which might be made in one or more pieces), was called in the said specification a packing or surrounding appliance. Now the chief object of the present invention is to render the aforesaid arrangement more effective, especially when applied to engines working at high and continuous pressures. For this purpose a stuffing box or other mechanical contrivance for retaining packing is connected or attached to, or is formed on or with the surrounding or packing appliance, so that the stuffing-box, &c., together with the hempen or other flexible packing with which it is furnished, or which it retains, shall move with, or partake of, the motion of the surrounding or packing appliance. *Patent completed.*

692. R. A. Brooman. *Improvements in apparatus for measuring and regulating the flow and pressure of gas, parts of which are applicable to hydraulic receivers and to steam generators.* (A communication.) Dated March 13, 1862.

693. G. Calvert. *Improvements in castors.* Dated March 13, 1862.

This invention relates to spherical castors, and consists in fitting in the socket an inverted cup, held by a stump or bar, and in placing above the upper end thereof a spring. Grips or claws are continued from the bottom of the socket to prevent the sphere from getting away; or instead of claws, a cup may be used. The sphere revolves in contact with the edges of the inverted cup, which is free to revolve round the stump; or the stump and cup may be fixed together, and then the stump and cup may move in the socket as one piece. *Patent abandoned.*

694. S. K. Thompson. *Improvements in railway apparatuses for communicating between guard and driver, and for coupling and uncoupling the carriages, parts of which apparatuses are applicable to connecting pipes and tubes.* Dated March 13, 1862.

This invention, for improvements in apparatuses for communicating between guard and driver, consists of the arrangements hereafter described:—The inventors carry a pipe or tube through every carriage, and form the connections between every two carriages by means of two trumpet-mouthed tubes, pressed into contact with each other by means of coiled or other springs, and free to recede within the tubes in the carriages for a certain distance. Or they form the connection by means of a flexible pipe, by preference of india-rubber; one end of the pipe is fixed to one end of the tube running through the carriage, while the other end is fixed to a bell or other shaped mouth, the lips or edges of which have connected to them guide rods, free to slide in and out of the carriage, and kept extended by coiled or other suitable springs. This flexible spring pipe coupling is applicable to pipes for conveying liquids and fluids generally. When required to increase the intensity of the sound produced by the guard in communicating through the tube with the driver, or *vice versa*, they place a valve near the mouth-piece, and in front of that valve introduce a bell-mouthed curved tube, open outside the carriage, for the purpose of catching the wind and of driving forward the sound made after the valve is opened. For coupling carriages the invention consists, under one modification, of two fixed hooks, and of two movable hooks. One fixed hook and one movable hook are fitted to each carriage to a boss, placed on the end of a bar, capable of being protruded from and drawn towards the carriage. The movable hooks are pinned to the bosses on the bars, and have springs fitted to them to cause them to assume constantly a position parallel to the rails; to each of the bosses a lever is fitted, and also a weight. The coupling is effected by the carriages being brought together, when the spring hooks will become engaged in the fixed hooks. To uncouple, the boss is turned by means of the lever, when two of the hooks on one boss will be turned and freed from one another; a eight is employed for bringing back the hooks into position, when the lever is let go. *Patent abandoned.*

695. J. B. Howell. *Improvements in the manufacture of chains and chain cables.* Dated March 13, 1862.

Here the inventor employs steel or iron, or a combination of steel and iron, rolled of any required thickness and breadth, with one face concave, and the other convex in transverse section. The metal so rolled he forms into links of such shape as may be required, by coiling the strips of metal around a core or centre, which corresponds with the interior of the link to be made, and towards which the convex surface of the metal is placed. He taps 2, 3, 4, or more, coils continuously, the one in the other, the convex surface bedding into the corresponding concave surface. For this purpose he heats the metal bar or strip in a suitable furnace, to a welding heat, and while so heated, winds it up on the core or centre before-named, and welds it throughout as it is being coiled up, pressure being exerted by a suitable bar, or part at the point of contact and welding, to insure the uniting of the metal. To further insure and improve the main of the coils of the link, he causes a current or blast of air to impinge on the point of contact and union or welding of the metal, which has the effect of increasing the heat of the iron, and removing any oxide or scale formed on the uniting surfaces. *Patent abandoned.*

696. H. Fletcher. *Improvements in neck-ties, scarfs, cravats, and collars.* Dated March 13, 1862.

This consists in attaching, and combining permanently, a collar to a neck-tie or cravat, or scarf, instead of such articles being distinct and separate as at present practised, and the invention applies to washing ties, cravats, or scarfs, so that the collar and tie, cravat, or scarf, can be washed together as one article, instead of separately, if necessary. By this invention, the collar requires no band, but is simply sewn to the material which forms the tie, &c. *Patent abandoned.*

697. W. E. Newton. *An improvement in armour plates for vessels of war.* (A communication.) Dated March 13, 1862.

This relates both to armour plates applied on the outside of wooden hulls, and to iron plates attached directly to the frame of the vessel, whether such frame be constructed of timber or iron. The invention consists in a mode of fitting together and combining the marginal portions of the armour plates, whereby the plates will be so locked as to hold each other both in a direction lengthwise of the vessel to which they are applied, and also in a vertical direction, and thereby assist in holding each other to the sides or frames of the vessel, and in strengthening the vessel. The necessity of using plates of very large size will also be obviated. *Patent completed.*

698. E. Bolton. *Improved apparatus for transferring liquid matters from one vessel to another.* Dated March 13, 1862.

In adapting this invention to the use of soap boilers, who require to transfer the saponaceous mixture while in a liquid state from one pan to another, or from the pan to the soap frames, or from the pan to a cistern or receiver, the inventor fits through a socket, in the centre of the pan, a tube which passes down to the surface of the soap, or other manufactured liquid. This tube, which is closed at the top and opens into the pan, has a branch, or branches, either metal or flexible, leading off to the soap frames or other vessels in the same room or rooms above or below. The pendent portion of the tube is fitted with a steam jacket, and so also is the branch tube or branches leading from the upper part to the soap frames or other receiver. *Patent abandoned.*

699. R. Schomburg. *Improvements in purifying illuminating gas.* Dated March 13, 1862.

Here in order to separate from gas the sulphide of carbon with which it is commonly contaminated, and which when the gas is burned produces sulphurous acid, which is destructive to furniture and otherwise injurious, the inventor causes the gas to come in contact with hydro-carbon or other oil, or a solution of fat, soap, or resin; these substances have the property of absorbing the sulphide of carbon. The purification may be effected either at the gas works, or by each consumer, and he prefers to use for the purpose a disc of perforated metal kept constantly revolving; the lower part of this disc dips into the oil or other liquid, and brings up as it revolves a film of the material, portions of the film closing the perforations in the disc. The gas is caused to come in contact with the disc, and pass through the perforations therein, so that the liquid may be able to act on every portion of the gas. When the purification is effected separately by each consumer, they combine the purifying apparatus with the gas meter, and cause the perforated disc to be driven thereby. When the liquid becomes saturated with sulphide of carbon, the latter may be separated and obtained by a process of distillation, leaving the oil or liquid in a state to be again used. *Patent abandoned.*

700. J. Kent. *Improvements in cleansing and bleaching.* (A communication.) Dated March 13, 1862.

This consists in subjecting cotton and other vegetable fibre, whether in the form of yarn or thread, or made up into fabrics or otherwise, to the following process: Lime and soda are mixed (in the proportion of about 8 lbs. of carbonate of soda to 1 lb. of lime) with water, and allowed to stand to settle, when the clear liquor is drawn off or separated from the solid matters. It is found that the strength of the liquor when used should mark about one and a-half to two and a-half degrees of Twaddle's hydrometer, a strength of one and a-half degrees is found sufficient for fine light goods, and for heavier goods a greater strength. The yarn, thread, or fabric, or other preparation of vegetable fibres, is steeped in this liquor for from 30 to 50 minutes, more or less, as the case may require; fine goods require about 30 minutes, and stouter ones a longer time in proportion. The process of cleansing and bleaching is then finished in the usual way.—*Patent completed.*

701. A. Quinard. *A machine for manufacturing horse-shoe nails.* Dated March 14, 1862.

This invention is not described apart from the drawings. *Patent completed.*

702. R. Garthwaite. *An improved mode or design for providing extra, superior, or better accomodation in double-tenement houses.* Dated March 14, 1862.

Provisional protection has not been granted for this invention.

703. G. H. Birkbeck. *Improvements in trusses or bandages, and in pessaries to be used therewith when required.* (A communication.) Dated March 14, 1862.

This relates to the arrangement and combination of a jointed and movable pessary, a replacing and graduated relieving apparatus or instrument for keeping the uterus in its place, and intended for the prolapsus utery, and to remedy the displacement of that organ. This instrument is connected to or combined with a double-jointed hypogastric bandage, with a posterior pad or cushion, by a curved supporting arm of swan-neck form which fits the convexity of the pubis, and which can be moved as required to the right or left, in order to adopt itself in the most convenient manner possible to the intravaginal rod which carries the bowl or hollow elastic instrument for supporting the deranged organ. The mode of jointing the intravaginal rod with the curved arm or swan-neck connection allows the rod to move freely round its vertical axis, so as to perform the lateral anterior, posterior, and all the motions intermediate to them; and, lastly, to describe a cercuitous movement. The pads or cushions are jointed to the hypogastric truss, which are capable of being readily fixed and adjusted in any desired position; these pads or cushions are intended to sustain the weight of the abdomen, or to exercise a pressure on the region of the arms, or upon any one or more of such points. *Patent completed.*

704. G. Bennett. *An improvement in the coating and covering of wrought iron, for the purpose of preserving it, and preventing oxidation.* Dated March 14, 1862.

To render the iron fit to receive the coating and covering it must be prepared in the following manner:—The inventor mixes with 10 gallons of cold water 1 lb. of sulphuric acid, in which he places the iron intended to be coated, and lets it remain six hours; he then takes it out, and scours it with sand or emery, washes it well in clear spring water, and then places it in a stove heated to 212 degs. Faht. for ten minutes; it is then fit for the coating. The coating is made as follows:—28 lb. of flint, calcined and ground fine, 14 lb. of borax pulverized; these are calcined together till they are fused; lets them cool, and adds to them 5 lb. of potter's clay; he grinds these ingredients in water together, to the consistency of paint, and coats the iron with this to the thickness of about one-tenth of an inch. When this has become set, which it will be in a dry place in a few minutes, he then proceeds to apply the covering, which must be very carefully dusted over it, before it becomes dry, and which is made of 62 lb. of white glass, 12 lb. of borax, and 10 lb. of soda; he grinds these to a fine powder, and then lets them be vitrified in a crucible. When cool, he grinds this compound in water until very fine, then places in a kiln until quite dry. He then takes of this composition 22 lb., and 8 oz. of soda, mixes them in hot water, submits them to a moderate heat in a stove, and a fine powder will be produced. He sifts this powder evenly over the coating, and then places the iron so covered in a stove at a temperature of 212 deg. Faht. to dry; he then places it in a kiln, such as is used by china manufacturers for fixing enamel. The kiln must be heated to a sufficient degree to fuse the covering; the iron must be gradually heated at the mouth of the kiln, and then placed in the full heat till the covering is fused, when it must be gradually withdrawn to cool. *Patent abandoned.*

705. G. H. Sanborn. *Improvements in gas regulators.* (A communication.) Dated March 14, 1862.

This consists in regulating the pressure of gas between the main or sheel pipes and the burners, to check or reduce the pressure on the remaining burners, when some of the whole number of burners are not being used, and to keep the flow of gas to the burners uniform and steady, and at the most economical amount, whatever number of burners may be in use. *Patent abandoned.*

706. L. Gabler and M. Zingler. *Improvements in manufacturing articles from ivory and bone.* Dated March 14, 1862.

Here the patentees take ivory powder, or bone, and reduce it to a fine powder; this powder they mix up into a dough with a cementing liquid, such as a solution of gelatine or gum ammoniacal; they then press this dough into a mould or form, so as to shape it into the article required. The mould used is arranged so that it may be closed, in order that a considerable pressure may be applied to the dough without causing it to flow out. The joints of the mould, however, are not so tight as to prevent the escape of the water or liquid with which the ivory or bone dust is mixed, one principle object of the pressure being to expel this liquid and the air. The article after a time is removed from the mould, and soon becomes as hard as ivory, which

in other repects it resembles. Colouring matters may be mixed with the dough if desired. *Patent completed.*

707. G. T. BOUSFIELD. *Improvements in machinery for digging and disintegrating the earth for agricultural purposes.* (A communication.) Dated March 14, 1862.

The object here is to dry up soil by rotating tools, which enter and pry off soil in a manner analagous to the operation of a hand-spade or fork. To this end the first part of this invention consists in the combination of a series of rotating digging tools with a carriage frame, by which they are moved forward, and with mechanism, which causes the series of diggers to enter the earth, so as to divide the earth into successive slices, whose sides are perpendicular to the line of progression of the machine, and after penetrating to pay off and raise the slices in a way analogous to the operation of a hand-spade or fork by the continued rotation of the series. The object of the second part is to break the clods effectually after they are raised, and to detach them from the diggers. This part of the invention consists in combining the series of rotating diggers constructed and operated substantially as above set forth, with cleansers which extend between the diggers after they rise from the earth, so that the slices or clods raised by the diggers are operated upon by the said cleanser and are broken. The object of the third part is to enable the diggers to be set to penetrate the earth to different depths as desired, and to carry the diggers above the ground when not in use, and this part consists in combining the carrying wheels with the carriage of the digging machine by cranked axles controlled by a lever and winch, or their equivalent, so that the carriage and diggers can be lowered or raised upon the carrying wheels by operating the said winch. The object of the fourth part of this is to enable the digging mechanism to be operated and propelled in a simple and effectual manner by steam power, so that the machine constitutes a digging locomotive, and this object is effected by combining the steam engine or engines of the locomotive with the diggers, so that the latter may not only dig the earth, but also constitute the drivers, by which the digging locomotive is caused to progress. *Patent completed.*

708. A. J. PATERSON. *Improvements in the construction of electric telegraph cables.* Dated March 14, 1862.

This invention consists in the employment of a flexible or jointed pipe or tube, or series of tubes, within which the insulated conducting wires are placed. The pipes or tubes possess great tensile strength, and may be made watertight by gutta percha, india rubber, tarred hemp, or any suitable material or combination of materials, with or without wire, as circumstances may require. This flexible jointed tubing may be protected from corrosion, when made of metal, by galvanising or by being coated or covered with gutta percha, marine glue, or any other like protecting agents. *Patent completed.*

709. M. A. MUIR, and J. MCILWHAM. *Improvements in railway sleepers and chairs, and in the mode of fixing rails.* Dated March 14, 1862.

The improved sleeper is cast in the form of a disc; there is a central boss which forms a base, from which the chair jaws spring. This part of the sleeper is cast thicker than the other portion, and below it is further strengthened by a transverse rib, which extends across the underside of the boss, and has formed on it a feather, which is directly under the centre of the rail, and which fits a notch in the bar. From the raised central part the surface of the sleeper slopes slightly towards the margin, the rim being curved in an outward direction, somewhat similar to the lower part of a bell. The sleepers when laid upon the ground are connected by transverse tie bars, which extend beyond the centre of the sleeper, and this part of the tie bar is notched to fit the feathered part of the central rib of the sleeper. The tie bar is fastened to the sleeper by a saddle bolt, which passes up through the disc, and is secured thereto either by a nut or split key. The second part of the invention refers to a mode of fixing rails in the chairs. *Patent completed.*

710. W. TURNER. *Improvements in the construction of bakers' ovens, and in the use of furnaces and other apparatus connected therewith, and in the means of appliances employed therein.* Dated March 14, 1862.

Part of this consists in using a square or other suitably shaped oven, having metal doors extending the entire width thereof. These doors are lined or cased with fire-clay, fire lumps, or other suitable material, and are hinged at the top on a straight bar, which extends the whole length of the breastwork of the oven or ovens, the said bar being fixed parallel with the spring of the arch of the oven; the doors being thus hinged their own weight will cause them to fit closer, and thereby the oven will retain the heat better than if the doors were hinged from the sides or bottom thereof. The inventor also uses a furnace and flue, and places the furnace-doors in a parallel or nearly parallel line with the oven doors, and causes the flue to rise from the contrary or opposite corner to that of the furnace, by which arrangement the whole area of the oven or ovens becomes equally heated. The furnace opening on the square side of the oven opposite to that of the flue will afford a greater radiation of heat than would an opening on the angular side of an ordinary oven. *Patent abandoned.*

711. A. COLES and W. COLES. *Improvements in the construction of trusses for cases of hernia.* Dated March 15, 1862.

This refers to a previous patent, dated 5th July, 1821 (No. 4567), and comprises certain improvements, whereby it is not necessary that the trusses should be expressly manufactured for each description of abdominal hernia, as the pads need not be at different angles to the body spring. We cannot give space to the details of the invention. *Patent completed.*

712. W. CLARK. *An improved break for railroad carriages.* (A communication.) Dated March 15, 1862.

This consists in the use of what the patentee terms a tumbling-rod, which is placed longitudinally underneath each carriage, just above its axles, the tumbling-rods of the several axles comprising a train, being connected together and so arranged that they, with their draw bars, may be rotated and also lowered and raised, and by means of suitable gearing, connected with a slide and belt slipper. The above parts are used in connection with two cones, a belt, and two cylinders, one cone and cylinder being placed on an axle of each carriage, and the other cone and cylinder on a lever which is connected to a chain attached to the break bars, all being arranged substantially, as shown, to effect the desired end. *Patent completed.*

713. H. EMANUEL. *An improvement in the manufacture of ornaments for personal wear.* Dated March 15, 1862.

For the purposes of this invention the inventor uses ivory as the body mounting or setting of the article, thus:—the inventor takes the ivory in a piece, and cuts or otherwise forms it into the desired form, and he combines it with metal and with gems (real or artificial), stones, or other articles used as ornaments, by cutting or otherwise forming in the ivory a recess or recesses, or opening or openings, and when required he bores or drills orifices in such recesses or openings, and sets the gem, or stone, or other article, in a rim or setting of gold or other metal, which he attaches by cementing, riveting, or otherwise, into the ivory. *Patent abandoned.*

714. C. N. KOTTULA. *Improvements in the manufacture of combined soaps.* Dated March 15, 1862.

This invention consists in the combination of pearl ash with combined soaps, whether with such combined soaps as result from the combination of a curd with a hydrated soap, according to the invention patented by James Blake and Francis Maxwell (No. 2,016, August 30, 1856), or with such combined soaps as result from the combination of a curd soap with elements producing a hydrated soap, no matter in what manner they may be manipulated, combined, and finished. Or with such combined soaps as result from the combination of any ordinary finished soap with a hydrated soap, or with the elements producing a hydrated soap, mottled or not, and with or without resin. *Patent completed.*

715. G. B. PETTIT. *An improved method of, and apparatus for, heating water and other liquids, applicable also to the evaporation of liquids.* Dated March 15, 1862.

This invention consists in heating water for baths and other purposes, and in evaporating liquids by means of what the patentee terms a "floating fire." The apparatus consists of a double bowl or cup of sheet metal, with a space between the two cups, with tubes establishing communication between the inside of the inner cup and the water in which the apparatus floats, and with a central pipe rising from the bottom of the inner cup above the line of flotation. He inserts a pipe, connected to a gas supply by flexible tube or otherwise, and fitted at its lower end with a burner with radial jets, into this central pipe, and fixes it so that the jets shall not touch the outer cup. He places a cover of mica or other transparent material on the central pipe, and lights the gas jets prior to inserting the burner. Air channels for supplying air for supporting combustion are carried down the outer cup. In some cases he dispenses with the central tube, and forms the burner on or attached to one or other of the cups. According to the size and purpose to which the apparatus is to be applied, so must the number of gas jets be varied. *Patent completed.*

716. J. SMADJA. *Improvements in bustles and crinolines, and in materials used in their construction.* Dated March 15, 1862.

This invention is not described apart from the drawings. *Patent completed.*

717. W. MCADAM. *Improvements in the manufacture of blocks, pulleys, and weights for window sashes and other purposes, and in the mode of applying the same.* Dated March 15, 1862.

This relates to the application of clay or other suitable mineral substance, either in the form of earthenware or glass, to the manufacture of blocks, pulleys, and weights, and which have hitherto been manufactured of metal. Under one modification of these improvements, as applied to the hanging of window sashes, the block or frame in which the pulley or pulleys run, is formed of clay, moulded to the required form, and afterwards glazed and fired in the usual way. The sheaves or pulleys are also formed of similar materials, and various kinds of clay, such as is used in the manufacture of porcelain and all kinds of earthenware. Instead of using iron or other metal for weights, it is preferred to make them of the heavier kinds of earthenware. These weights are either moulded solid, or with an internal cavity, to be filled with "mine dust," or other suitable mineral material, or which may be mixed with the clay for the purpose of increasing the specific gravity of the weights. *Patent completed.*

718. J. HUNTER. *Improvements in reaping machines.* Dated March 15, 1862.

This relates to reaping machines of the direct acting class. Under one modification the machine consists of an open rectangular frame, in the central part of which are fitted the bearings of the axle, carrying the main bearing wheel. The front part of the frame is prolonged outwards, and carries at its extremity an ordinary leading wheel, and extending laterally from the front of the main frame is the bar or frame carrying two knives or serrated cutters, the extremity of the cutter being supported on a wheel in the ordinary manner. On the axle of the bearing wheel, and outside the rectangular frame, is fitted a wheel or disc, the periphery of which is corrugated, or forms a series of undulations at right angles to the circumference of the wheel. This disc is keyed to the main axle, and it traverses within a longitudinal slot or opening formed in a movable bar, which slides to and fro in brackets projecting laterally from the main frame. At the extremities of the slotted opening in the sliding bar are two anti-friction rollers, and as the disc in the main axle rotates with the motion of the bearing wheel, the projections of the corrugated disc act alternately on the anti-friction rollers, and cause the sliding bar to traverse to and fro with a rapid reciprocatory movement. To the front end of the sliding bar is jointed a duplex link piece, the extremities of which are connected to two small shafts, arranged in a vertical position, and carrying at their lower ends bell crank levers. Each of these bell crank levers is connected to a serrated cutter of the ordinary kind; the cutters are arranged one above the other, and slide to and fro in the laterally projecting cutter bar before referred to. The rapid oscillatory motion of the sliding bar communicates a corresponding movement to the cutters, the duplex arrangement of the cutters admitting of a reduction in the extent of their lateral traverse, and a corresponding saving in the wear and tear of the moving parts. As the machine is moved forward, the crop is rapidly cut by the movement of the cutters at the parts where they cross each other, which, when arranged in this manner, operate with a scissor-like action. *Patent completed.*

719. J. GRANT. *Improvements in the construction of portable railways, and in the trucks or carriages to be used thereon.* Dated March 15, 1862.

The first part of this invention consists in securing plate rails upon longitudinal wooden sleepers, the ends of the sleepers having tongue and socket joints to fit into each other, to support the ends when a heavy weight is passing over them. The gauge of the sleepers is secured by means of transverse rods, with bent-up ends. The patentee proposes to fit the rods with pulleys for supporting a rope, if it be desired to work the carriages by means of a stationary engine. The patentee also proposes to fit the carriages with one pair of running wheels only, to enable them to pass round curves, which curves may be at right angles, the curved rails being used in combination with a movable or swivelling straight-piece. The second part consists in enabling one wheel to run loosely on its axle the other being made fast. The carriages are so made that they can be joined at their ends and form one long carriage; thus they are enabled to carry a bulky load. When necessary the carriages can be so formed as to be tipped up on end, or sideways, to deposit their load. *Patent completed.*

720. A. Y. D. SCOTT. *Improvements in the manufacture of cement.* Dated March 15, 1862.

Here the patentee claims subjecting lime in the pulverized state to the action of sulphurous acid gas, and an oxydizing agency, in the manner and for the purpose described. *Patent completed.*

721. S. N. DE LA H. DE BARBEZIERES. *An improved construction of horse shoe.* Dated March 15, 1862.

The object here is to provide for the feet of horses a roughened surface which, on the occurrence of a sudden frost, will admit of being readily attached to their hoofs and detached therefrom without the aid of a farrier, the ordinary shoes remaining undisturbed in their position, and ready for service on the breaking up of the frost. To this end the patentee has devised an expanding supplementary shoe, which has one of its quarters hinged at the side, to allow of its opening laterally, and then closing upon the ordinary shoe. *Patent completed.*

722. J. AVERY. *Improvements in purifying coal.* (A communication.) Dated March 15, 1862.

Here the coal is subjected to the action and heat of free steam, in a suitable enclosed chamber, and also to the chemical action of common salt, potash, quicklime, and sal ammoniac. *Patent completed.*

723. G. HAMILTON. *Improvements in tumbler locks.* Dated March 15, 1862.

This invention has for its object the so constructing tumbler locks that the proper positions of the tumblers, for allowing the bolt to be shot, may not be detected by applying pressure to the bolt in the well-known manner. For this purpose, the patentee mounts the tumblers on an eccentric, the pin of which is carried by the case of the lock. The tumblers are each capable of turning around the eccentric, and when the tumblers are correctly set by the key before the bolt is shut back, the eccentric will not be caused to turn on its pin, but when the bolt is pressed back, before the tumblers are correctly placed, the stump upon the bolt will press against the tumblers and cause them to recede, the eccentric, by turning on its pin, allowing them to do so. The turning of the eccentric on its pin he arranges to bring into action a catch or stop for the bolt to come against, and he also arranges the lock so that the bolt, when further pressed on, shall, by acting on the stop, cause the eccentric still further to turn on its pin, and so move back the tumblers away from the stump on the bolt, in order that the stump shall no longer press against them. *Patent completed.*

724. J. ROBEY. *Improvements in manufacturing and refining sugar, and in apparatus employed therein.* Dated March 15, 1862.

Here in place of using the ordinary vacuum or other pans now in use in the manufacturing and refining of sugar, a rotating vessel is employed of a suitable form, by preference of a cylindrical shape, with hemispherical or curved ends within which the saccharine fluid is placed and heated, the saccharine fluid only occupying a comparatively small portion of the cubic capacity of the vessel, by which means the saccharine fluid in the vessel will constantly gravitate to the lowest point, whilst the inner surface of the vessel above the body of the fluid therein will be covered with a film of the fluid, by which a very extensive and comparatively thin surface of the fluid will be presented for evaporation, and this effect of heating surface may be extended if desired, by making the rotating vessel of corrugated or other suitable metal. *Patent completed.*

725. W. PICKSTONE. *Improvements in the manufacture of piled fabrics.* Dated March 15, 1862.

Here a fabric is woven consisting of cotton warp wefted with cotton yarn, to form the ground or body of the fabric, and it is also wefted with a mixed weft consisting of cotton and woollen, or worsted yarn, such mixed wefting being suitably carried or floated on the face as to admit of the mixed weft being cut into a pile, as when weaving plush, velveteens, and such like fabrics as have their surface or floating wefts cut into a pile. By thus using combined weft for producing the pile of a fabric, a peculiar effect will be produced, when such fabric is dyed, by reason of the difference of tint, or character of colour imparted by the dye to the animal and to the vegetable fibre of the pile. *Patent completed.*

726. J. T. PENDLEBURY and T. PENDLEBURY. *An improved form of lubricator.* Dated March 15, 1862.

This consists in an improved form of grease cock for lubricating cylinders, pistons, pumps, and other mechanism,

which lubrication is effected by the action of the machine itself. The patentees construct the cock with a funnel at the top of the usual form for receiving the oil or other lubricating material: the cone or plug they make hollow, and fitted with a stuffing box and projecting spindle of any convenient form; the plug or cone has an aperture corresponding in size with the hole in the bottom of the funnel for allowing the oil to pass into it, and another hole is placed near this last-named one, coinciding with a tube passing up through the centre of the funnel holding the oil, having its mouth above the surface of the tallow or oil, for the purpose of allowing the escape of air. A third hole is formed in the opposite side of the plug from the two last-mentioned ones, which is turned off when the two others are in position, a pipe passing up through the funnel of the cock, connected with the inside of the cylinder, or with the boiler, so as to allow the passage of the steam up through it. This pipe is connected with this last hole. A passage is formed through the stem of the cock passing into the cylinder in the usual way. The operation is as follows:—the cock being turned so as to bring the aperture in it, so as to coincide with the hole in the funnel, the oil will run down and fill the hollow plug, the air going off by the pipe passing through the funnel; the plug is then removed by a lever, or other contrivance connected with the machinery, which brings it over the passage in the stem, and also the third hole in connection with the pipe from the cylinder or boiler, which by the pressure of the steam, forces down the stem and into the cylinder; the lever on the spindle then turns the plug, and the same action is repeated. *Patent completed.*

727. W. Clark. *Improvements in water meters.* (A communication.) Dated March 17, 1862.

This consists in the arrangement within a stationary cylinder or cylindrical pipe of two or more oblique-bladed wheels, secured at suitable distances apart on a central shaft, so applied as to rotate freely within the said cylinder or pipe, and two or more series of stationary spiral water passages surrounding the shafts in the spaces between the said wheels, such passages and the blades of the said wheels being set at angles of 45 degrees or thereabouts to the axis of the shaft and cylinder or pipe, but their obliquity being in opposite directions relatively to the said axis, so that water passing through the cylinder or pipe may be caused to strike the blades of the wheels perpendicularly, or nearly so, to the faces thereof; by this system of wheels and passages the water as it passes through the cylinder or pipe is made to act on the several wheels in succession, so that greater power is obtained to give motion to the shaft, and the indicating apparatus which is geared therewith than could be had with a single wheel, while at the same time there is no material increase of friction on the shaft. *Patent completed.*

728. A. S. Stocker and A. R. Stocker. *Improvements in the manufacture and construction of articles to be worn by bipeds and quadrupeds.* Dated March 17, 1862.

This invention consists in the manufacture of metal boot heels, and tips, by rolling or otherwise, forming the rods of iron out of which they are to be made so as to cause them to be indented or of an uneven surface, or surfaces, on those sides which have hitherto been rolled and used in a plain state, and in bending or countersinking such or other heels and tips. The invention also consists in the manufacture of horse shoes, by the use of certain dies, cast, sunk, or otherwise constructed in such manner, and of the desired configuration, into which iron or other metal having been before-hand properly prepared, is intended to be forced or pressed, which, by the aid of such dies, and the pressure applied thereto, and the article to be made will cause the crude metal to take the formation intended, any surplus web or waste attached to the shoe beyond its proper form being removed by the aid of clipping tools, as is well understood in the trade. *Patent completed.*

729. W. E. Gedge. *Improvements in the manufacture of crinolines.* (A communication.) Dated March 17, 1862.

Here it is proposed to accomplish the covering of crinoline steel by paper, in combination with net work or open tissue of very light fabric and inexpensive material. The paper of any colour is to be placed on each surface of the steel, and covered with the tissue, both being generally of the same colour, and the paper may be wound on the steel as a band, or plasted, or glued thereon. *Patent abandoned.*

730. W. B. Lord and F. H. Gilbart. *Improved means or apparatus for raising, lowering, and releasing ships' boats, or other heavy bodies.* Dated March 17, 1862.

In carrying out this invention the patentees pass through the kelson of a boat, amidships, or in the centre thereof, and under, or nearly under, athwart, a bolt or pin, securing the end thereof by a countersunk nut, a washer being placed between the nut and keel, or by other fastening. The bolt or pin aforesaid forms the shank of a metal block or head piece, and through this block is left a slot; a flat circular piece or disc, bearing a head and ring, is fitted into the block and works on a spindle within the slot; a portion of the disc is cut out to permit the introduction of two hooks into the slot, and each of these hooks is furnished with a notch and a hole through which to pass the light of the lowering ropes. The hooks are inserted side by side within the slot, but coming from the opposite direction, say right and left. When the hooks are in position within the slot, the head of the disc is (by means of a lanyard attached to a ring) pulled down, and it thus secures the hooks in position; and the greater the strain on the lowering ropes the firmer the connection between the disc and the notches of the hooks. From the eye and shank of each hook a rope (the lowering rope) passes to and through eye-bolts, secured in like manner as the centre pin, fore and aft in the kelson perpendicularly (or nearly so). Over these eye-bolts are lugged rings, or plates having lugs, and these rings or plates are held suspended over the eye-bolts by means of lashings passed through the before-mentioned lugs, and attached to the sides of the boat. The ropes which pass fore and aft from the shanks of the notched hooks serve to suspend the boat from the ship's davits, and by hauling on to or releasing these ropes from the belaying pins, the boat is raised or lowered. The apparatus may be cased in as far as the eye-bolts if desired. Either on the davits or on the side of the ship they fit a grooved catch or slide; at the end of the sennet or rope, which is passed over the boat to prevent its swaying with the motion of the vessel, they attach a slide pin, the head thereof fitting loosely into the grove formed in the catch or slide when the boat is secured, and sliding down and falling out of such groove when the boat is lowered. When it is desirable to lower the boat for service, the crew pass into her, she is then lowered from the davits at a signal from the officer in command, a lad pulls the lanyard, causing the head of the disc to assume a vertical position. This movement brings all the slots or openings in the block, disc, and hooks square with each other, the hooks are thus released, and the weight of boat and crew causes them to leave the block, pass through the eye-bolts and suspended rings, and the boat meets the water on an even keel. *Patent completed.*

731. L. P. Mongruel. *An improved cold vapour generator, which may also be used in the carburation of illuminating gas.* Dated March 17, 1862.

This invention is not described apart from the drawings. *Patent completed.*

732. W. Bowser. *Improvements in ships' fire-hearths or broiling and cooking apparatus.* Dated March 17, 1862.

This invention relates to a previous patent, dated March 8, 1845 (No. 10,576). The apparatus is of a rectangular form in plan, having ordinarily three boilers of different sizes at one side, heated by means of a fire-grate directly beneath them, whilst at the opposite side there is formed a cooking range with a separate fire grate and hot plate, and an oven or ovens occupy the middle portion, their doors being in the remaining sides. The flue from what may be termed the cooking or range grate is, according to one modification, made to immediately descend from the top of the grate down between the grate and the oven, and to pass thence under the oven, and finally to the uptake or chimney. By these means the oven is more satisfactorily heated than in the ordinary arrangements, in which the heat is applied in some cases to the top and sides only, and in others to the top and sides prior to being applied to the bottom. In another modification, whilst the flue is applied to the oven in the direct manner already described, there is introduced in addition a boiler to receive heat from the fire, such boiler having a part rising up a short distance between the grate and the first descending part of the flue, and passing under the horizontal part so as also to receive heat from that part of the flue. The steam generated in this boiler may be conducted by pipes to cooking utensils mounted on a light frame, at a sufficient height above the hot plate to leave the latter clear. The grate for heating the boilers is provided with an adjustable partition piece to permit of contracting the fire space when only one or two of the boilers are in use. The flue from the boiler grate passes inwards under the boilers, and a short distance up along their inner ends, whence it is continued downwards in a box or division at one side, and passing round and under the oven, finally unites with the flue from the cooking or range grate. The apparatus may be made with flues similar to those hitherto employed, and dampers or other contrivances may be used for diverting the fire gases from either grate into whichever series of flues may be described. *Patent completed.*

733. G. Davies. *Improved apparatus for drawing.* (A communication.) Dated March 17, 1862.

We cannot here give space to the details of this mention. *Patent abandoned.*

734. J. and W. Weems. *Improvements in apparatus for indicating the pressure or quantity, and in regulating the discharge of fluids.* Dated March 17, 1862.

One part of these improvements relates to the arrangement and construction of apparatus for indicating the pressure of fluids. One modification, as applied to a steam pressure gauge, consists of a diaphragm of india-rubber, metal, or other suitable material, fitted in a small steam chamber. To this diaphragm is attached a rod, the upper part of which forms a rack that gives motion to a wheel; depending from this wheel is a lever or rod with a ball or weight attached to its extremity. The spindle of the wheel projects through the dial or index face, which is graduated to show the pressure in lbs., and to this spindle the pointer or index is attached. When the pressure of the steam, air, gas, or other fluid acts upon the diaphragm, it raises the vertical rack, and moves round the wheel to which is attached the lever weight, and which serves to keep the index in a vertical position when not otherwise acted upon. The pressure on the diaphragm causes the lever weight to rise towards the centre, at the same time giving motion to the pointer, and thus indicates the pressure. *Patent completed.*

735. B. Todd. *Improvements in the manufacture of antimony and the oxide of antimony.* Dated March 17, 1862.

This invention consists in burning the sulphide of antimony, or the oxy-sulphide of antimony, by throwing it on a fire in a furnace, or by mixing it with a carbonaceous substance, and burning it in a crucible, retort, or furnace, and causing the ascending vapours to pass with a current of air through flues or condensers, by which process all the antimony contained in the ore will be deposited in the said condensers or flues in the state of oxide, and the sulphur volatilized in the state of sulphurous acid gas. To manufacture antimony the oxide of antimony obtained in the flues and condensers by the above process is to be mixed with a carbonaceous substance and alkali, and smelted in crucibles, or in a retort or furnace so arranged that any fumes arising from the process of reduction may pass into flues or condensers to be deposited. *Patent completed.*

736. W. Barford. *Improvements in rollers for rolling land.* Dated March 17, 1862.

For the purposes of this invention, in constructing a roller, whether consisting of one or more cylinders, in order that the same may be weighted with water more advantageously than heretofore, each roller or section of a roller is closed at its ends, the ends being connected by a suitable tube or hollow passage to allow of the axle passing through it. The ends of the tubular passage are strengthened or bushed where they receive and turn on the axle. The cylinder or cylinders used in constructing a roller may be of wrought or cast iron, and such is the case in respect to the ends or covers. These parts are put together water-tight, and such is the case in respect to the tubular or hollow passage which connects the two covers or ends of a roller or of a section of a roller. Each roller or section of a roller has an opening in it through which the supply of water is introduced, and such opening is closed by a screw plug, or by other convenient instrument. By these means each roller and section of a roller consists of a vessel closed at each end, with a hollow passage through the centre thereof, whereby the supply of water introduced for adding weight thereto may rise above the axle and even fill the roller or sections of which a roller is composed. *Patent completed.*

737. W. Barber. *Improvements in the manufacture of hats.* Dated March 17, 1862.

On the 2nd day of July, 1861, the present patentee obtained provisional protection (No. 1,675) for an invention consisting in curling, shaping, or tipping off the brims of hats by means of a mould of the form of the intended brim, with which the brim of the hat is forced in contact by means of an elastic bag, into which water, air, or other fluid is forced. He did not, however, proceed with his application for a patent for this invention, as he found practical difficulties in removing the hat from the mould after the brim was curled, which at that time he was unable to overcome. A part of this invention consists in a method of overcoming this difficulty, and this he does by employing, in combination with the bag and fluid pressure, as before explained, a mould made in sections or parts, so that the hat, when it is removed from the principal parts of the mould, takes with it some of the parts of the mould representing the brim, and which, were they not movable, would impede the withdrawal of the hat; these parts of the mould are afterwards readily removed from the hat. *Patent completed.*

738. G. T. Bousfield. *Improvements in cranks for driving sewing machines and other machinery.* (A communication). Dated March 17, 1862.

This invention consists in attaching the connecting rod of the treadle to two auxiliary pins, which are attached to and vibrate upon the crank pin, instead of attaching the connecting rod directly to the crank pin. And in connecting and disconnecting the said auxiliary pins alternately with and from the crank pin at the beginning of each stroke in such a manner that the advance auxiliary pin (considering the direction in which the crank is to turn) shall become temporarily fixed with respect to the crank pin, and perform the usual function of a crank pin, while, by the same movement, the rear auxiliary pin is loosened, and permitted to turn freely upon the crank pin. The said alternate connecting and disconnecting of the auxiliary pins with respect to the crank pin, operated by a treadle in the ordinary manner, produces a continuous revolution of the crank in one given direction, and avoiding all stoppage upon the dead centres. *Patent completed.*

739. J. M. Courtauld. *Improvements in power looms.* Dated March 17, 1862.

This invention consists in the introduction into the web or fabric in the course of manufacture of a slide, lever, or other mechanical agent connected with the gear, by which the loom is thrown in and out of work, and made to act when no shoot is laid in, in such manner as to throw the loom out of work. *Patent completed.*

740. J. Hicks. *Improvements in mercurial barometers.* Dated March 17, 1862.

This invention consists in terminating the barometer tube at top in a coil, instead of employing a straight tube as heretofore; and for some purposes in forming the tube throughout in the shape of a spiral coil. It is necessary that the length of straight tube, together with a straight line carried through the centre of the coil, should make up a length of from 31 to 34 inches; and when the tube is in the form of a helical coil from the bulb upwards, then a straight line from the bulb to the top of the coil must measure from 31 to 34 inches. The object of the invention is to obtain a more extended scale than is procurable with a straight tube. The inventor proposes that the scale shall be spiral, and that the coils or rings of the scale shall be placed between the coils of the barometer tube. *Patent abandoned.*

741. E. Smith. *An improvement in watch keys.* Dated March 17, 1862.

This invention consists in constructing watch keys which act in a similar manner to those known as "Brequets," but which are applicable to winding watches, whether the winding is effected by turning the key from right to left, or *vice versa*. In the brequet keys, a key winding by turning from right to left will not effect the winding of a watch where the key has to be turned from left to right. The improved key consists of a spindle united to a ball, or other piece free to be turned in a rotary direction, upon a pin carried at the upper part of a guard or cage, which cage is large enough to allow of the ball revolving within it, and which is connected at bottom to a collar within which the upper part of the spindle is freq to revolve. *Patent abandoned.*

742. W. Gossage. *Improvements in the manufacture of soda and potash.* Dated March 17, 1862.

The patentee claims the manufacture of soda and potash in a caustic state, by causing carbonate of soda, or carbonate of potash in a state of solution, to become filtered through slaked lime as described. *Patent completed.*

743. T. Waller. *Improvements in breech-loading fire-arms.* (A communication.) Dated March 17, 1862.

This invention cannot be described without reference to the drawings. *Patent completed.*

744. T. Myers. *Improvements in meters for measuring water, gas, or other fluids.* Dated March 17, 1862.

This invention consists, firstly, of a measuring cylinder furnished with valves, valve boxes, and ducts, so arranged as to act with the requisite sensitiveness, and that the action shall only be carried on during supply, and shut off immediately the supply ceases. The cylinder is fitted with a piston, having a piston rod protruding beyond the top of

the cylinder with collars thereon, between which works the end of a lever, supported by standards, with a roller at one end to prevent friction, the other end being forked to guide and work a slide valve, made of brass or other suitable material, or rollers which press upon a diaphragm-valve, made of india-rubber or other elastic or pliable material; such slide or diaphragm-valve covers several ducts (five for instance) but the patentee does not confine himself to any particular number of ducts, their shape, size, or position. The slide valve, or the rollers acting on the diaphragm, are so arranged as to press upon and close one or more of the said ducts at one time. Some of the ducts (two by preference) lead some (one by preference) to the upper and some (one by preference) to the lower part of the cylinder, and hence, upon water, gas, or other fluid being admitted by the supply pipe, it will, according to the position of the piston and the attached piston-rod, cause the opening of some of the ducts, and allow the water, gas, or other fluid, to enter either above or below the piston, and thus keep it in motion. *Patent completed.*

745. M. A. F. MENNONS. *Improved means of arresting headstrong or runaway horses.* (A communication.) Dated March 18, 1862.

This invention consists in the utilization of the shocks produced by certain descriptions of magneto electric, and electro magnetic, apparatus as a means of checking the course of headstrong or runaway horses. To this end a pair of flexible conductors, formed of single or tressed copper or silver wire, is inserted in the reins of the bridle, the forward extremities being each connected with a piece of moistened sponge, so attached to the muscol or cheek bands as to press, when in position, against each side of the horse's head at a short distance below the eye. The opposite extremities of these conductors, prolonged beyond the grasp of the reins, are fitted with rings or other suitable metallic attachment, so arranged as to be readily connected with the poles of an induction coil set within reach of the rider or driver as the case may be. *Patent completed.*

746. M. A. F. MENNONS. *An improved combination of cooling and filtering apparatus, forming a safe for the preservation of solid and liquid provisions.* (A communication.) Dated March 18, 1862.

This invention is not described apart from the drawings. *Patent completed.*

747. M. A. F. MENNONS. *The application to the manufacture of paper, pulps of a vegetable product not hitherto used for that purpose.* (A communication.) Dated March 18, 1862.

This invention consists in the application of the stalks or branches of the potato plant (solanum tuberosum) to the manufacture of paper pulps. The stalks or branches to be thus applied are cleansed, bleached, and reduced, by the processes adopted in the treatment of rags and other fibrous materials, and the resulting pulp is afterwards converted in the ordinary way into paper or cardboard of the different qualities required. *Patent abandoned.*

748. M. A. F. MENNONS. *An improved needle-threading apparatus.* (A communication.) Dated March 18, 1862.

This invention is not described apart from the drawings. *Patent abandoned.*

749. J. BANKS. *Improvements in electro-magnetic telegraph printing apparatus or marking instruments, or apparatus to be used in connection therewith.* Dated March 18, 1862.

These improvements in the arrangement of electro-magnetic telegraph printing apparatus and transmitters consist in employing two helical coils, which the patentee prefers to place vertically, and to use or employ projecting polar terminations, so that the armature may be attracted upward to the under side thereof, when the polar terminals are applied at the upper ends of the soft iron cores; and instead of employing a bar armature, one end of which is made to come in contact with each pole or polar terminal, he employs a circular armature, in the form of a disc or a wing, and mounts it upon a spindle or rod, held and guided parallel to the soft iron cores, with a means of adjustment applied at the step-bearing or pivot. This spindle or rod, with the circular armature is free to rotate, and so present a different part to each polar terminal from time to time. The spindle or rod is prolonged beyond the armature, and has on its extremity either a button-shaped striker, or a marker of any convenient shape. The marking part of the apparatus is carried by the same framing or mounting as the magnetic coils, and thus if the coils be placed vertically, and the marking or printing apparatus applied above them, the paper strip or ribbon may be indented from the under side, or inked, or otherwise marked on its upper face during its passage through the sheath or guide. Instead of employing a rotating disc mounted on a spindle, working in fixed bearings, such disc being free to revolve in the direction of the paper, or made to revolve in a contrary direction by means of clock-work, he either employs a roller similar to a printer's inking roller, mounted at a short distance above the paper, and capable of revolving freely, or he employs a thin cake, strip, or rod of solid ink, held or contained in a sheath, mounted in a carriage, or supported in any convenient manner above the paper, against the point of which solid ink-marker, or against the printer's ink-roller, the paper is pressed in contact during the transmission of the electric currents through the helices or coils; thus, on making and breaking contact, dots and spaces, or lines and spaces, are formed on the strip of paper. *Patent completed.*

750. H. BAILY. *Improvements in the manufacture of paper.* (A communication.) Dated March 18, 1862.

The machine employed to reduce the wood into pulp fit for paper is composed of a circular grater in tempered steel, presenting on its circumference a puncture or spiral cutting. This grater is mounted on a stand like that of a grindstone, and receives a movement of rotation from five to six hundred revolutions per minute. It is surrounded on all sides with a metallic envelope, of which the lower part is terminated by an orifice serving as a tunnel or feeder to the water and the pulp. In this envelope are bored in the upper part, and perpendicularly to the axle, one or several openings, serving as receptacles to the blocks of wood cut to their measure, which determined weights sliding on a vertical stem force against the asperitus that are presented by the points of the grater, so that, being in contact with the wood, this grater in its rotation bears on the ligneous fibres of the wood, and thus reduces them to filamentary pulp. On each side, and near the middle of the circumference of the grater, are two taps from which a jet of water flows, and detaches the pulp which might adhere to the points of the grater, and forces it towards the lower part of the envelope, so that it may flow into a frame or box lined with fine metal sheets, from which the water escaping leaves the pulp almost dry and easy to be transported to the cylinders to finish its entire preparation, to whiten and fix itself by the ordinary methods employed for pulp of rag. *Patent abandoned.*

751. T. DUNN. *Improvements in the construction of bridges, roofs, houses, and other structures.* Dated March 18, 1862.

This invention is not described apart from the drawings. *Patent completed.*

752. W. TONGUE. *Improvements in machinery and in processes for preparing, heckling, dressing, and combing flax, hemp, silk, and other fibrous materials.* Dated March 18, 1862.

Among the numerous features of this invention are the following:—According to one part of the invention the patentee first opens and straightens the fibres of silk, flax, hemp, China grass, rhea, or other fibrous materials of this character, by machinery similar to that described in the specification of a patent granted to Henry Rawson, dated January 27th, 1859 (No. 249), or by any of the improved arrangements of machinery for this purpose described in the specification of a patent granted to the present patentee, dated March 5th, 1862 (No. 596). Having thus previously prepared the fibrous material, he proceeds to form it into tufts in the ordinary manner, preparatory to subjecting the same to the process of heckling, according to another part of this invention. The arrangements of machinery and processes which are employed in carrying out this part of the invention consist in first opening and straightening the silk, flax, hemp, or other fibrous material, by the arrangements of machinery referred to for this purpose. He then conducts it, in the form of a sliver or otherwise, to a filling engine or other machinery for forming it into tufts, but he prefers for this purpose to conduct the fibrous material through a screw gill feeding apparatus, from which it is detached in the form of tufts by means of an ordinary nipper. The detached tufts are transferred to rotating combs, several of such detached tufts being accumulated upon each rotating comb, from which they are taken by hooks or holders preparatory to being placed in and operated upon by ordinary heckling machinery, or by that of the improved construction forming part of this invention. The hooks or holders of heckling machinery constructed according to this invention may be of the ordinary construction, but in place of moving them continuously through the machine, or bodily from opposite one set of heckles to another set, as heretofore practised, he causes them to travel through the machine by a step-by-step movement, the movement by preference taking place when the pins of the heckles are inserted amongst the fibres, and he causes the heckle plate or bar to partake of this forward movement, in order that the fibres may be maintained in a vertical position whilst being operated upon. Another part of the invention consists in the application of a reciprocating comb or combs to act as cleansing apparatus to the machinery for combing fibrous materials. *Patent completed.*

753. C. ILES. *Improvements in the manufacture of umbrellas and parasols.* Dated March 18, 1862.

This invention relates, first, to the construction of an improved top notch or runner notch for umbrellas and parasols. The second part of the invention consists in making middle bits for umbrellas and parasols in such manner that the parts which come into contact with the fork have a raised projection in order to strengthen and widen this part of the middle bit. The third part of the improvements consists in making the handles and tips of umbrellas and parasols of china, or other vitrified materials; also in the use of hard cement, such as Keene's, or any other similar hard cement capable of bearing a smooth and polished suface. Fourthly, the invention consists in making the heads of the rivets used for connecting the middle bits and stretchers of umbrellas and parasols of a rounded, dome, or scutching pin shape, and when the rivet is passed through the hole the inventor stamps in suitable dies a head of a similar form on the other end, or a washer may be placed on this end, which may be riveted or stamped, to connect the stretcher and middie bit firmly together, and by these means he makes a very strong and neat point. *Patent abandoned.*

754. A. A. BEAUMONT and J. A. ESCALIER. *A flying top.* Dated March 18, 1862.

This invention consists in the construction of a hollow top forming the centre of a helix, to which it is fixed; the lower part of the top is reduced in size to allow of its being adjusted to a handle made to receive it. The handle is hollowed out cylindrically at its upper part, in order to contain a bobbin, on which a small cord or a piece of string is wound for giving a to-and-fro motion to the bobbin, which is provided at its upper part with a cup of a concave form, to receive with facility the top. A hole is made in the handle for the passage of the cord or string. This toy is used by holding the handle in one hand, and imparting a rotary motion to the bobbin, to wind up the string; the top is then placed in the cup, and it is only necessary to pull the string to cause the top to fly off and turn in a vertical direction. *Patent abandoned.*

755. J. A. JAQUES, J. A. FANSHAWE, and F. JAQUES. *Improvements in the construction of elastic surface rollers.* Dated March 18, 1862.

The patentees claim the combination of the hard and soft compounds of india-rubber, known in this country as junction rubber, with any suitable core, for the purpose of producing elastic surface rollers, as described. *Patent completed.*

756. J. A. ROCKETTI. *Improvements in meteorological instruments and thermometers.* Dated March 18, 1862.

This invention consists in placing the engraved and graduated scales of thermometers, barometers, and other meteorological instruments, in either flat or round glass tubes, which may be sealed up at the ends, so that no water or air can get at them. The protected scales are adapted to the mercurial or capillary tubes by being secured along side of them on flat pieces of wood or metal in any convenient manner, and all the useful parts of the instrument being protected by a glass covering, it follows that little or no damage can result to the scale from atmospheric influences. *Patent abandoned.*

757. J. WRIGHT and H. WHEATCROFT. *Improvements in apparatus and machinery for lasting and making boots and shoes.* Dated March 18, 1862.

This invention consists of a machine for lasting boots and shoes when the uppers are secured and the inner sole is to be affixed. On a suitable stand or frame are mounted four sliding plates, two corresponding in outline to the sides of the boot or shoe, and the two others fitting the toe and heel. These plates are adjusted by screws to any size of boot, and slide in grooves, so as to open and shut by the action of two parallel shafts, on which are mounted cams, pressing against the two side plates; the ends of the two side plates are formed wedge-shaped, so as to embrace the two toe and heel pieces. By this means the inventors are enabled to contract the whole of the plates simultaneously when not acted on by the lever. The plates are kept open by a spring, and the last, with the upper leather and inner sole, is placed within these plates and supported from underneath at each end; the plates are then closed, which stretches the upper leather, and makes it to fit accurately the last. On the same spindle which actuates the slide are fixed pincers, which grasp the projecting edges of the leather, stretch it tight, and keep it so till the workman has pegged the upper to the inner sole, the tacks or pegs being put in through holes or slots in the edges of the sliding plates. *Patent abandoned.*

758. S. SLACK. *Improvements in the manufacture of stockings and other fabrics in circular knitting machines.* Dated March 18, 1862.

The object of the present invention is to introduce a seaming thread in that part of the work intended to form the back part of a stocking, corresponding in position with the seams in stockings, which are joined up the back, and this object is effected simultaneously with the working of the other parts of the machine. For this purpose a space is by preference left in the circular head by a needle being left out. In the space thus formed an extra thread is worked in, such extra thread by preference being a thicker thread. This extra thread is caused to loop alternately with the thread on the one side and on the other, changing from one to the other at every course. In order to effect this alternate working of the thick or extra thread with the thread on either side, the carrier of the thick or extra thread has imparted to it (by means of a cam or other suitable equivalent) an alternating motion. The mode of introducing the seaming thread at the back of a stocking made in a circular machine may, however, be varied. In like manner shirts and other like fabrics made in circular machines may be seamed at the sides or parts requiring such seams. *Patent completed.*

759. F. WARNER. *Improvements in cocks or taps.* Dated March 18, 1862.

For the purposes of this invention the valve spindle has formed on it a toothed rack, which is received into and works within the water or steam way of the tap or cock. The face of the valve is by preference circular, and is packed with a soft packing where it comes against its seat, which is preferred to consist of a projecting ring, with a thin edge, to enter the packing in the face of the valve. Or the seat may be packed or have a washer of soft material, and the projecting ring may be on the face of the valve. The toothed rack used is constructed as follows:—There is a slot formed through an extended portion of the spindle of the valve, on the inner surface of one side of which slot the teeth forming the toothed rack are formed in such manner that, when the pinion used with the rack is in its place, the diameter of the pinion nearly corresponds with the width of the slot. The axis of the pinion passes through a suitable stuffing-box into the interior of the body of the cock or tap. This stuffing-box is constructed in such manner that, by screwing down the packing which takes its bearing on the axis, the requisite friction is obtained to resist the tendency of the axis to turn with the force of the pressure of the fluid. It is preferred that the arrangement should be such that about a quarter turn of the axis of the pinion should be for opening and closing the valve. The lower end of the axis of the pinion is pointed, and has its bearing in a suitable cup. The guide spindle of the valve is made three-sided, the sides being hollow as heretofore, so that the water, or steam, or other fluid may pass freely on the three sides of the spindle, whilst the three angles of the spindle serve to keep the valve and spindle correctly in the water or steam way. *Patent completed.*

PROVISIONAL PROTECTIONS.

Dated May 22, 1862.

1548. P. R. Hodge, Tokenhouse-yard, London. Improved dinner, supper, breakfast, or dessert plate.

Dated May 31, 1862.

1648. T. T. Lawden, gun manufacturer, Birmingham. Improvements in certain descriptions of single and double-barrelled guns.

Dated June 19, 1862.

1806. H. Ruston, Northampton-road, Clerkenwell. Improvements in plaiting machines to plait cotton yarns, silk, or like fibrous materials.

Dated July 28, 1862.

2133. T. A. Favrichon, St. Symphorien de Lay, France, merchant, An apparatus for the speedy and economical heating of baking ovens, and also for using their excess of heat

Dated August 15, 1862.

2299. J. Barclay, Gravel-lane, Southwark, engineer. Improved machinery for the manufacture of nails.

Dated August 21, 1862.

2336. M. Wilkinson, Blackburn, Lancashire, carder. Improvements in carding engines, parts of which improvements are applicable to drawing and such like frames.

Dated August 26, 1862.

2365. G. Davies, Serle-street, Lincoln's-inn, civil engineer. Improved machines for washing skeins of cotton, linen, wool, or silk. (A communication.)

Dated September 1, 1862.

2420. W. Edge, Clerkenwell. Improvements in the manufacture of albert chains, and in the mode of securing the same to the vest of the wearer.

Dated September 4, 1862.

2446. W. Clark, Chancery-lane, London, engineer. Improvements in the manufacture of a blue colouring matter. (A communication.)

Dated September 11, 1862.

2495. W. A. Munn, Throwley House, Faversham, Kent, An improved apparatus for capping, loading, and closing cartridges for breech-loading fire-arms.

2497. G. Weeks, Bromley, Kent, ironmonger. Improvements in constructing frames, trays, pots, or holders for flowers, plants, or shrubs, growing or otherwise, with arrangements for their display, and also for drainage.

2499. F. Datichy, Mortimer-street, London, engineer. Improvements in steam engines.

2501. R. A. Brooman, 166, Fleet-street, London, patent agent. Improvements in implements for cultivating the soil. (A communication.)

2505. A. Barclay, Kilmarnock, North Britain, engineer. Improvements in locomotive boring and winding engines.

2597. J. and F. Walker, Leeds, flax spinners and copartners. Improvements in machinery for combing and carding or hackling flax, silk, wool, and other fibrous substances.

2509. T. Molineux, John Dalton-street, Manchester. Improvements in pianoforte actions.

Dated September 12, 1862.

2511. A. E. H. B. Butler, Kirkstall Forge Company, Leeds. Improvements in machinery for straightening and polishing cylindrical bars of iron and other metals.

2512. J. B. Smith, Bury, Lancaster, engineer. Certain improvements in washing and mangling machines applicable in part to steam dyeing and to bleaching.

2513. J. Thom, Canterbury-place, Lambeth, mechanical dentist. Improvements in mounting or fitting artifical teeth.

2514. J. R. Johnson, Stanbrook Cottage, Hammersmith, and J. S. Atkinson, Red Lion-square, Middlesex. Improvements in machinery for manufacturing printing types.

2515. J. Bower, Carlow, civil engineer. Improvements in railway sleepers.

2517. J. Howie, Hurlford, Ayr, North Britain, coal master. Improvements in the construction of the crossings and switches of railways.

2519. H. Higgins, Salford, Lancashire, machine maker. Improvements in machinery or apparatus for opening, cleansing, or carding cotton and other fibrous materials.

Dated September 13, 1862.

2521. W. Harkes, Lostock Gralam, Chester, agricultural implement maker. Improvements in machinery for mowing and reaping.

2523. M. Chadwick, Chapel-field, Manchester, machine maker. Improvements in machinery for doubling, folding, or plaiting cloth or other woven fabrics.

2525. T. W. Cowan, Kent Iron Works, Greenwich, engineer. Improvements in the construction of portable or fixed pumps.

2527. H. Bennett, Wombridge Iron Works, Salop, iron master. Improvements in machinery or apparatus for the rolling of wire rods.

Dated September 15, 1862.

2529. E. G. Chant, London, gentleman. Improvements in self-binding portfolios or holders for newspapers, music, documents, letters, and other papers, or for woven or other fabrics, which it may be desired to bind or hold together.

2533. W. L. Tizard, Mark-lane, London, engineer. Improvements in the construction of ships, vessels, cupolas, and forts, and in apparatus employed therein.

2535. J. Webster, Birmingham, Warwick, engineer. Improvements in the manufacture of nitric and nitrous acids, and other nitrogenous compounds.

Dated September 16, 1862.

2537. J. Whines, Pimlico, Middlesex, carpenter. Improved machinery for filling dipping clamps with tapers and match splints.

2539. J. G. Bunting, Trafalgar-square, Charing Cross, Middlesex. A mechanical horse break.

2541. S. Flexen, Braziers'-buildings, Farringdon-street, London. Improvements in apparatus for ventilating railway and other carriages.

2543. R. Moreland, jun., Old-street, St. Luke's, Middlesex. Improvements in machinery for preparing and cutting hops.

2545. H. Jordan, Southampton, engineer. Improvements in rotatory engines.

Dated September 17, 1862.

2547. L. Leigh, Seymour, Connecticut, United States. Improvements in certain machinery for stretching and glossing silk, wool, and other fibrous materials.

2549. R. Cranston, London, Edinburgh, and Glasgow, hotel proprietor. An improved washing machine.

2550. J. Simpson, Hulme, Lancaster, frame maker. An improved composition for coating or covering moulded or other surfaces, and in apparatus for applying the same thereto.

2551. W. E. Newton, Chancery-lane, Middlesex, civil engineer. Improvements in watches or time keepers. (A communication.

2553. J. Douglas, Blackfriars-road, Surrey, ironmonger and range manufacturer. Improvements in apparatus applicable to close fire ranges, usually termed kitcheners, for the purposes of ventilation.

2555. J. H. Johnson, Lincoln's-inn-fields, Middlesex. Improvements in gas burners. (A communication.)

Dated September 18, 1862.

2558. R. Kay, Castleton Print Works, Blue Pits, Lancaster, calico printer. Certain improvements in printing calico and other surfaces, and in apparatus connected therewith.

2560. W. H. Browne, Theobald's-road, and H. Armstrong, Manchester-street, gas engineers. Improvements in dry and wet gas meters.

2562. J. W. Woodford, Sutherland-street, Walworth, Surrey. Improvements in machinery and apparatus used for driving and drawing piles, also for raising soil, and also in shoes and hoops for piles.

Dated September 19, 1862.

2568. J. Smith and W. Smith, Collyhurst, Manchester, dyers and finishers. An improved combination of machinery or apparatus for doubling, measuring, and plaiting woven fabrics.

2570. D. C. Bridge and J. Dyson, Halifax, York, boiler and hot water apparatus manufacturers. Improvements in the formation of boilers to be employed for warming buildings and similar puposes.

2572. F. Savage, St. Nicholas Iron Works, Lynn, Norfolk. Improvements in traction engines.

2576. C. Chinnock, Brooklyn, New York, merchant. Improvements in the construction of corkscrews.

2578. E. Feis, Sise-lane, London, merchant. Improvements in the construction of locks, catches, or fastenings for purses, bags, or other receptacles. (A communication.)

Dated September 20, 1862.

2580. H. R. Fanshawe, Leadenhall-street, London. Improvements in the mode and means used in fishing in seas, rivers, and other waters.

2584. A. Prince, Trafalgar-square, Charing Cross, Middlesex. Improvements in steam, boiler, and other furnaces and in apparatus for feeding the same. (A communication.)

Dated September 22, 1862.

2586. J. Sanderson, Clerkenwell, Middlesex, dressing-case and desk maker. Improvements in writing desks and cases.

2590. M. Vogl, Sambrook-court, Basinghall-street, London, merchant. Improvements in fastenings for leggings and other articles of wearing apparel.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

1541. J. H. Perry. Curing diseases by magnetism.

1548. P. R. Hodge. Dinner, supper, breakfast, or dessert plate.

1552. W. Evans. Obtaining motive power.

1573. W. Worby. Reaping machines.

1595. C. H. Hodson. Defensive armour.

1596. H. Eaton. Presses for baling purposes.

1597. J. H. Kidd. Manufacture of compositions applicable for waterproofing fabrics.

1600. C. Cohen. Walking, umbrella, and other like sticks.

1603. T. Turner. Machinery for scouring and polishing knitting and other pins and needles.

1608. W. Blackmore, and H. Lamb. Burning lime stone and generating steam.

1613. H. Boetius. Condensing steam.

1617. C. D. Abel. Raising, propelling, or exhausting air. A communication.

1619. J. Paterson. Hammer or instrument for turning over the edges of a binding or strip of linen.

1620. W. Clark. Throwing the shuttles of looms. A communication.

1621. N. Lawton, and R. P. Whitworth. Carding fibrous materials.

1625. P. U. Payras. Protecting dry or green hides from vermin.

1631. H. P. Burt. Protecting wooden posts from decay.

1634. W. Eddington. Draining and tilling land.

1636. J. Ives. Washing and wringing clothes or fabrics.

1640. W. T. Smallwood, and W. Wright. Waterclosets.

1641. A. Moreau, and A. E. Ragon. Electro-magnetic machines.

1648. T. T. Lawden. Single and double-barrelled guns.

1654. B. Templar. Apparatus for registering and indicating billiards and other games.

1656. J. Elce, and W. J. Gradwell. Spinning, doubling, and winding fibrous substances.

1661. J. Key, and F. Potts. Producing designs in iron.

1662. C. E. Gray. Extracting, rendering, receiving, purifying, cooling down, and delivering oleaginous and fatty matters.

1665. E. Lloyd. Manufacture of paper.

1670. G. Gurney. Production and application of artificial light.

1673. J. Biers. Shoes for horses and other animals.

1675. J. L. Norton. Raising and forcing water.

1678. G. Peel, and J. Simpson. Working hydraulic presses.

1691. E. Conroy. Machinery for cutting corks and bungs.

1694. J. Bell. Fastenings for railway chairs.

1701. E. Conroy. Cutting corks and bungs.

1702. G. Hadfield. Manufacture of casks or barrels.

1708. A. V. Newton. Knitting machinery. A communication.

1748. F. Tolhausen. Surgical injecting apparatus. A communication.

1763. W. E. Newton. Improvements in fire-arms. A communication.

1764. W. E. Newton. Elongated bullets. A communication.

1782. W. J. Curtis. Screw Propellers.

1864. F. Tolhausen. Lock or locking apparatus. A communication.

1911. W. E. Newton. Picking or gathering cotton. A communication.

1954. P. B. O'Neill. Screw wrenches or spanners.

2013. H. Barber, and H. De Garrs. Rolling metals.

2042. R. Dunn. Furnaces.

2044. J. Dickson. Manufacture of caustic soda and carbonate of soda.

2083. R. Grogan. Screw propellers.

2101. J. Dickson. Treating copper ores.

2147. A. Boyle, and T. Warwick. Manufacture of ribs and stretchers of umbrellas.

2228. J. Macintosh. Obtaining and applying motive power.

2253. J. Dickson. Treating zinc ores.

2254. J. Dickson. Treating ores.

2265. J. Dickson. Manufacture of chlorine for commercial purposes.

2395. H. Jones. Breech-loading fire-arms.

2488. F. Hands, and H. Holland. Manufacture of black ornaments.

2537. J. Whines. Machinery for filling dipping clamps with tapers.

2602. W. Clark. Signalling. A communication.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2218. W. H. Buckland.
2228. A. S. Stocker.
2286. W. Brookes.
2262. W. E. Newton.
2263. W. E. Newton.
2267. J. Macintosh.
2269. J. Macintosh.
2274. E. O'Connell.
2312. A. Whitock.
2277. W. Macfarlane.
2283. W. E. Newton.
2306. C. F. Beyer.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2191. J. R. Musgrave, R. Musgrave, and J. Musgrave.
2184. W. Kempe.
2267. J. Thornton, A. Thornton, W. Thornton, and H. Thornton.
2230. T. Dickens.
2232. F. C. Lepage.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

2602. W. Clark, 53, Chancery-lane, engineer. Improvements in signalling. (A communication.) Dated September 24, 1862.

2612. M. A. F. Mennons, 24, Rue du Mont Thabor, Paris. Improvements in the construction of chair settees. (A communication.) Dated September 25, 1862.

LIST OF SEALED PATENTS.

Sealed October 3, 1862.

956. T. Silver.
959. G. Moulton.
963. S. Fielding, S. Fielding, jun., R. Fielding, and T. Fielding.
964. R. A. Brooman.
972. W. Begg.
974. J. Colling.
975. A. Clare.
976. L. Faconnet.
977. R. A. Kobitzsch.
980. C. S. Duncan.
982. W. Simons.
985. G. Hazeltine.
987. T. Jackson.
991. J. Brown.
997. F. W. Brearcy.
998. E. H. C. Monckton.
999. J. Jaques.
1000. B. Sharpe.
1004. J. Wright.
1005. T. Cobley, and J. Wright.
1007. J. E. H. Andrew.
1009. G. Hollinshed.
1010. J. and J. Bullough.
1011. W. Taylor.
1013. J. Jones.
1014. J. Langston.
1016. J. Knowelden.
1023. W. Nunn.
1024. J. Houghton.
1027. C. P. Coles.
1030. H. Deacon.
1033. G. Burge.
1034. C. Bartholomew, and J. Heptinstall.
1037. W. Fox.
1043. W. E. Gedge.
1045. F. Rigollot.
1049. W. Clark.
1054. J. Bunnett.
1065. F. Tolhausen.
1069. J. K. Hampshire.
1071. C. Harratt.
1085. G. Bedson.
1088. R. A. Peacock.
1188. W. E. Newton.
1202. R. Mushet.
1224. W. E. Newton.
1262. W. E. Newton.
1285. W. E. Newton.
1319. S. Merolla.
1320. W. E. Newton.
1646. J. Betteley.
1731. J. Alison.
1857. E. C. Nicholson.
1877. J. B. Coquatrix.
2162. W. Wanklyn.
2189. J. Briggs.

LIST OF SPECIFICATIONS PUBLISHED

For the Week ending September 27, 1862.

No.	Pr. s. d.	No.	Pr. s. d.	No.	Pr. s. d.	No.	Pr. s. d.	No.	Pr. s. d.	No.	Pr. s. d.
489	2 6	500	0 4	511	0 10	522	0 4	533	0 10	543	0 10
490	0 4	501	0 4	512	0 4	523	0 8	534	0 4	544	0 8
491	0 8	502	0 4	543	0 8	524	0 4	535	0 4	545	0 8
492	1 2	503	0 4	514	0 10	525	0 10	536	0 8	546	0 10
493	0 4	504	0 8	515	0 4	526	0 4	537	0 10	547	0 4
494	1 6	505	0 6	516	0 10	527	0 8	538	0 10	548	0 4
495	0 4	506	0 8	517	0 8	528	0 10	539	0 4	559	0 4
496	1 0	507	0 4	518	0 4	529	0 10	540	0 4	550	0 10
497	0 8	508	0 4	519	0 4	530	0 8	541	0 4	551	0 4
498	0 6	509	0 8	520	0 4	531	0 10	542	0 10	552	0 4
499	0 8	510	0 10	521	0 4	532	1 6				

Note.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, OCTOBER 17, 1862.

ENGINEERS AFLOAT.

It is a fact which is discreditable in the highest degree to the Board of Admiralty, that the steam officers of the British Navy continue to labour under disabilities and annoyances of the most irksome and humiliating character. We make this assertion deliberately and advisedly, and we have the fullest evidence of its truth. From all quarters the same information comes to us, and it is time, therefore, that an alteration, sweeping and effectual, should be made. It is not to be borne that a body of men, whose ability and intelligence are at least on a par with those of any other class of the community, whether ashore or afloat, should be treated in the scurvy way in which Naval Engineers have been and are being treated by those whose duty it is rather to honour and respect them. It it a truism which none can gainsay that the safety of this nation and certainly its maritime supremacy, are dependent at this moment upon the efficiency of engineers. Upon them do we rely for those scientific improvements and modifications in the arts of war which are the characteristics of the age in which we live, and which must determine the question of our national independence. Ashore, this truth is recognized to the full, both by those in authority and the public at large. Afloat, if we may judge by the conduct and language of those who may be termed, for convenience sake, the sailing officers of the Navy, it appears neither to be understood nor recognized. These latter, "dressed in a little brief authority," take every opportunity of exerting their power and influence to the disadvantage of their brother officers of the steam department. The natural consequence is, that there is scarcely a ship belonging to the British Navy wherein discontent and dissatisfaction do not prevail among the Engineer officers. The root of this fearful evil—an evil which might, in case of war, be fraught with the most fatal consequences—lies undoubtedly in the system adopted by the Admiralty for supplying the navy with Engineers. That system, therefore, must be remodelled before a radical and salutary change can be made in the position of the class of officers of whom we speak.

The whole of the existing arrangements for the enlistment of young Engineers into the Navy are of a one-sided, and "one-eyed," character. The advantages are all with the employers, and the disadvantages with the employed. What can be more unjust, for example, than the bargain by which a young man is entered on the Government books as a Probationary Engineer for one year, at the expiration of which he may be dismissed at a moment's notice, but cannot dismiss himself? If at the end of that period his imperious masters at Whitehall think proper, they may cancel his appointment as Acting Second Class Assistant, but they do not leave him the same option. He becomes, indeed, to a certain extent their slave, and cannot claim his discharge however he may desire to quit a service in which he finds contumely and social degradation, instead of honour and moral dignity. If he happened to be on a foreign station, forcible detention would prevent his leaving the ship, and should he escape from durance vile he is a deserter! Is not this a state of affairs which should cease? Is it compatible with those notions of justice and fair dealing which happily distinguish the Anglo-Saxon race? Would it be tolerated in engagements with individuals instead of the Board of Admiralty? Is it extraordinary that the desertion of Engineer officers from the Navy should be of constant recurrence? Is not the system, as we have said, "one-sided and one-eyed"—one-sided in giving a supposed advantage to the Government—and one-eyed in looking only at the convenience of the employer, and not regarding that of the employed? We put these questions to the Admiralty and to the public, and we have no doubt at all as to the answer of the last-named referees, however obliquity of vision may influence the replies of the former.

Again, we ask why a Second Class Assistant who has passed for a first class should be kept out of his promotion, as he almost invariably is, for nine or twelve months? Or why is a First Class Assistant under similar circumstances made to wait for *his* promotion to the rank of Engineer for a like period, or perhaps even longer? Assuredly these are grounds for dissatisfaction—legitimate dissatisfaction—and they have to be encountered on the very threshold of the service. The pernicious system applies to no other class of officers in Her Majesty's service, and it is therefore a badge of inferiority, and one which is too often made use of to the disparagement of the unfortunate Engineer. This is another disability which the Admiralty have the power to remove, although it appears they have not the inclination. Many of the remarks we have thought it fit to make respecting Engineers afloat, have taken the form of queries, but we have by no means exhausted the list. We should be glad to learn, for instance, the "reason why" no promotions at all take place among Naval Engineers on foreign stations, when death, invaliding, or other causes create vacancies on board Her Majesty's ships on those stations. It may be fairly assumed that there are present First and Second Class Assistants who are in all respects qualified and eligible for filling the vacant posts of Chief Engineer, Engineers, and First Assistant Engineers, and, except for the purpose of keeping alive disaffection, there seems no reason at all for shutting the door of promotion in their faces. It is a fact, nevertheless, that in August last no less than nine such vacancies remained unfilled on the Pacific station—the consequences being anything but pacific to those who were baulked of their fair expectations.

These grievances are a sample of many of which Naval Engineers have to complain, and of which it shall be ours to attempt zealously to free them. They are all remediable, and the first step towards effecting a cure is to discover and make known the seat and nature of the disease. As to the second series of evils to which reference has been made, they are of a more practical nature, and involve the social status of the Engineer afloat, his position in relation to his brother officers, the ship's company, and the accommodation provided for him in his floating home. These are all questions which are worthy of ventilation and which *must* eventually be solved satisfactorily to the persons most interested in them. The time is approaching when the importance of Naval Engineers, their talent and their usefulness, *must* be acknowledged, even by those who now seek to debase them, and who in many instances are intellectually and morally the inferiors of the men they spurn. The days of "class feeling"—a spurious bantling begotten of Ignorance and Pride, and without a trace of real "gentle blood" in its veins—are numbered, and the sailing officers of the British Navy had better prepare for burying it "deep in the ocean's bosom." It is *real worth* which is now regarded with favour by Englishmen generally, and not that adventitious and emasculate thing *empty rank*, which has too often elbowed its neighbour out of doors, or off the quarterdeck. So is there hope for Engineers afloat.

IRON WALLS AND NAVAL GUNS.

TO THE EDITOR OF THE "MECHANIC'S MAGAZINE."

Sir,—A few months ago you liberally allowed me space in your columns to lay before the public my views on the absorbing question of the "Iron-Walls of Old England." I availed myself of the valuable privilege to some extent, and I had the satisfaction of contributing to rouse public attention to the subject. The constant agitation of the leading point, relating to the construction of iron armour and naval guns, in which the Mechanic's Magazine took the lead, resulted, whilst Parliament was sitting, in the abandonment of the Spithead forts, and the *amende honorable* by the Admiralty to the Iron Plate Committee, in a public acknowledgement of its public services. The handsome terms in which the chairman, Sir John Hay, and his colleagues, were mentioned by ministers in the House of Commons, lest the impression that the baleful influence of the controller's department would be overruled with reference to iron-clad ships, and the board be guided by better counsels.

A short time has sufficed to dissipate those favourable impressions. In the construction of ships' armour the recommendations of the committee are disregarded; the men of wood are again rampant; and if Parliament do not interfere we shall have millions again wasted in armour plating of the Warrior type, or on wooden ships partially protected on the "Reed" principle.

When, in accordance with the public professions of the Admiralty, it was rational to conclude that the cause of truth and justice prevailed, I closed my correspondence; but, under existing circumstances, I ask your permission to resume it. I have no pretention to lead the public, but the opinions I may offer, founded on experience and observation, may encourage and give activity to discussions which, affecting as they do the maritime supremacy of England, are of momentous character.

In my former letters I endeavoured to develop the rudiments of the art of armour-plating ships and batteries. These are now understood and canvassed by a great number of engineers, mechanicians, and ingenious inventors, and may be left to work their way.

The question has assumed large proportions. Principles are applied on a vast scale. Nations are constructing iron-cased ships and naval guns, whose efficiency is tested in real or mimic warfare. Plans are propounded of invulnerable armour, and of guns and projectiles which will penetrate plates of any thickness. It is no longer possible to separate the attack from the defence. Gunnery and fortification applied to ships have no scientific or practical value apart from each other. The power of the gun has to be measured as much by the armour it has to penetrate and destroy as by its own intrinsic force. This is the view to which public attention must be directed. It is that entertained by foreign governments and sedulously prosecuted by experiments in several States. As a case in point, we have an apt illustration at home, of which the features are sufficiently singular and instructive to deserve notice.

The Admiralty had two pets—the Armstrong gun and the "Warrior" frigate. Both were ushered into the world by Tory and nurtured by Whig Lords. They were equally defects of solicitude to the Administration and the Opposition; neither could see the defects of their favourites, however evident to other persons. One of these pets has fallen into disgrace and is abandoned. The Armstrong gun has absolutely failed to fulfil its promise. All the favour lavished upon it has been in vain. All the boastings, exaggerations, and concealments practised for more than two years have failed to hide or palliate its deficiencies; and its complete failure is acknowledged by its best friends. Sir William Armstrong, it is determined, will be superseded. Our readers may rely upon that fact.

The "Warrior" is the remaining child of misfortune. It has its defects, and is a cruel disappointment to its patrons, but it is the surviving hope, and must not be abandoned. The strongest efforts are made to conceal its shortcomings and prolong the spurious popularity into which it has been forced by never-ceasing panegyrics.

Let us examine the "Warrior's" claims to public indulgence. Her advocates assert that, "to the credit of her architects (meaning the "Admiralty constructors), she creditably holds "the field against her assailants," and in evidence of that assertion it is assumed that the result of the last experiments at Shoeburyness has proved that, "taking a ship's battery "against a ship's armour, the superiority is on "the side of the latter." We demur to that assumption, and will proceed to show that the arguments on which it is founded are a series of fallacies and misrepresentations, similar to those which so long denied the defects and concealed the failure of the Armstrong gun.

It is said, first, "That a gun of 95 cwt., or "less than 5 tons, is the *heaviest* that can be "worked with success, or even safety, on "board a floating vessel." Second, "That "not one of the guns which pierced the 'War-"'rior' target can be considered as a ship "gun." Third, "That so long as she keeps "at sea she cannot be touched at all." Fourth, "That no *ship's gun* yet produced would be "effective against a first-rate iron-cased ship "(meaning the 'Warrior.')" Fifth, "That a "gun meant to pierce the 'Warrior's' sides "is either too light for its purpose or too heavy "to be carried at all." Sixth, "That it is pos-"sible we may have a vessel produced which "will carry a seven-ton gun," but that is not "the case at present. Seventh, "That it is "only a shore-gun that can pierce the 'War-"rior's' sides, and that only within a very "short range." Eighth, "That we have "frigates actually afloat which can resist any "gun yet tried of proportions available for "naval service."

This is the case of the Admiralty to uphold the falling reputation of the "Warrior." We cannot but declare our unqualified amazement at the boldness which gives utterance to such a tissue of unfounded assertions. They are all based on one eggregious error or voluntary mis-statement, with which we must deal in plain terms, to open the eyes of the untechnical public to the scandalous manner in which they are imposed upon.

It is not true that first-class iron-cased ships, such as the "Warrior" or the "La Gloire," cannot carry or work a gun heavier than 5 tons. Either of those frigates can and will carry guns of 7, 10, or 12 tons weight; that is to say, 90-pounders, 120-pounders, or 150-pounders, throwing solid and explosive projectiles which will penetrate the armour of the "Warrior." This at the Admiralty is a fact so well known that, if the 150-pounder Armstrong, which burst under trial, had been a success, the gratifying announcement would have been made to the country, that this tremendous weapon, whose destructive powers surpassed those of every other gun—because it was an Armstrong—would be adopted as part of the armament of the "Warriors" and "Northumberlands."

In fact, there is no reason why guns of that weight and calibre should not be carried and worked on board war ships of 5,000 or 6,000 tons burden. Any one who has paced the gun deck of the "Warrior" and inspected its structure—the massive iron girders, the strong planks and iron plate of which it is constructed, and the iron columns which support it—must be convinced that even a 24-ton gun could be trained and worked on that deck with the same ease as on *terra firma*. The number of guns, of course, would have to be diminished, to keep down the aggregate weight of metal to that of the complement of the guns originally designed as her armament. Thus, a frigate pierced for 50 five-ton guns would carry 36 of seven tons, 25 of ten tons, or 22 of twelve tons, without in the least affecting her displacement. The number of gunners would not be increased, and the probability is, that with the greatly increased space on the gun deck between the posts obtained by reducing the number, those heavy guns would be served and worked with greater facility than the larger number of lighter guns. It needs no argument to explode the specious assumptions put forth on behalf of the Admiralty to prove the invulnerability of the "Warrior" system of armour plating.

If, as we pointed out in a former article, a "La Gloire" be mounted with 120 to 150-pounders, her guns will, in a contest at short or long range, penetrate the "Warrior" plates, and speedily place her *hors de combat*. It is idle to keep up any delusion on that point. The recent experiments have proved conclusively that 4½-in. and even 5½-in. plates on wood backing, can be pierced through and through by 120 and 150-pounders; and also that even 68-pounders, at 200 yards, will destroy through-bolt fastenings, so that large plates will fall bodily off into the sea. The magnificent qualities of the "Warrior," as a sea-going ship, are constantly lauded, and, we admit, with much truth. Albeit, she "rolls awfully" in a rough sea-way. But these laudations are dust thrown in the eyes to conceal the real defect. The only question in this controversy is the *system of armour plating*. That system for the "Warrior" is 4½ in. of iron on a backing of 18 in. of teak, each plate weighing 4 to 5 tons, and fastened to a half-inch iron skin, with 1¼-in. through-bolts, and corresponding holes drilled through the plates. These are all sources of weakness. The system is defective. The wood backing offers no resistance, and is crushed into shreds by shot or shell.

You some time ago, in discussing the Spithead forts, refuted the arguments of a great daily authority by reminding him that ships would not come within the range of forts to be shot at, and therefore floating defences, which could move to the attack of invading ships, would be the most effective harbour defences. He now informs us, in your own words, that "*Ships will have to fight ships,*" to which I will add, what he seems to forget, that in the future, as in all past naval battles, the main and decisive conflict will not be at ranges of 1,000 or 600 yards, or even at 200 yards, but muzzle to muzzle, and I know I shall not be a false prophet in predicting that under such conditions a few broadsides of 68-pounders will smash the iron mail and destroy the fastenings of 4½-inch plates fitted with through-bolts to a wood backing.

The main question now is the improvement of naval armour. The construction of the iron cuirass of ships is a new science, which is yet in its infancy. It must not be supposed that the Lords of the Admiralty have, per saltum, attained perfection in the "Warrior" system. They may be too proud to listen to advice out of the circle of their own department, but misadventures, as in the case of the Armstrong pet, will, in spite of official resistance, force upon them the conviction that the chief cause of the "Warrior" target failures is the radical weakness of the system.

Mr. Whitworth, in his letter to the *Times*, has fully corroborated your exposure of the unfair report in the *Times* of the last experiments at Shoeburyness. With proper independence he refuses to allow one iota of the credit due to him alone for the success of his gun to be artfully claimed for Sir William, who, by the ill-advised advocacy of the *Times*, may truly be said to be in the mortifying predicament of the jackdaw stripped of the peacock's feathers.

CIVILIAN.

INTERNATIONAL EXHIBITION. JURY REPORTS.

CLASS VIII.—MACHINERY IN GENERAL.

JURY.

L. R. Bodmer, Switzerland; Consulting Engineer.
Chevalier de Burg, Deputy Chairman, Austria; Imperial Councillor; President of the Society of Arts and Manufactures at Vienna.
Earl of Caithness, London.
M. Chevalier, Chairman, France; Senator; Member of the Institute.
J. Hawkshaw, F.R.S., F.G.S., London; President of the Institution of Civil Engineers.
J. Hick, C.E., Deputy Chairman, Bolton; Civil Engineer.
J. M. da Ponte Horta, Portugal; Professor of Mathematics at the Polytechnic of Lisbon.
W. M. Neilson, C. E., Glasgow; Civil Engineer.
John Penn, C.E., London; Mechanical Engineer.
O. Pihl, Norway; Civil Engineer.
Du Pre, Belgium; Honorary Chief Engineer of Bridges and Roads.
W. J. Macquorn Rankine, Secretary, Glasgow; Professor of Mechanics in the University of Glasgow.
F. B. Taylor, United States; Mechanical Engineer and Designer.
H. Thomas, Zollverein, Berlin; Manufacturer.

ASSOCIATES.

Carl Jenny, Austria; Councillor and Professor in the Imperial Royal School of Mines at Chemnitz.
Paul Luuyt, France; Engineer to the Imperial Corps of Mines.

GENERAL EXPLANATIONS AND REMARKS.

1. This jury held in all, thirty-three meetings, commencing on the 7th of May, and terminating on the 20th of June, 1862.

2. In the course of those meetings they examined, considered, and adjudicated upon all the articles properly included in or transferred to Class VIII. which were mentioned in the Official Catalogue and ready for inspection, up to the date of their last meeting, with the exception of a few articles which, after careful search, they could not find, and of the fire-engines, which were submitted to a special Jury, for reasons which will be explained further on.

3. The Jury would have awarded medals to the following two articles, had they not been prevented from so doing, by Clause 5 of the Decisions of Her Majesty's Commissioners regarding Juries, because of the articles in question being exhibited by members of this Jury:—

United Kingdom:—

1801. Bodmer, R., and L. R.: Safety-valves for steam-boilers.

1955. Penn, J., and Son's: Marine engines, and parts of marine engines.

4. In considering the practical operation of the articles submitted to them, the Jury were careful

to come to no conclusion except such as was founded either on their own experience and observation, or on the authentic records of the experience and observation of competent persons not specially interested in the articles. Consequently, in the event of an article not having honours awarded to it by the Jury, it does not in every case follow that the Jury considered that article as having been proved to be faulty; but only that they were not able to obtain, during the time of their proceedings, evidence of its practical efficiency of that kind which they considered as alone sufficient to justify the awarding of honours.

5. Considering the shortness of the time allotted to them for completing their awards (viz., from the 7th of May to the 14th of June inclusive, afterwards extended to a few days longer), the Jury came to the conclusion that it was impracticable for them to institute exact experimental investigations, under their own superintendence, upon the mechanical efficiency of the various kinds of machines submitted to them.

6. Her Majesty's Commissioners, however, considered it desirable that such experiments should be made in the particular case of fire-engines; and inasmuch as the Jury could not undertake the superintendence of such experiments, that duty was intrusted to a special committee or Jury on fire-engines, to whom, also, the duty of making awards upon the fire-engines exhibited was transferred by Her Majesty's Commissioners. The awards of honours to fire-engines are nevertheless included in the general list of awards in Class VIII.

7. In adjudicating upon the articles contained in this class, it was necessary, for the sake of order and clearness, to divide them into subdivisions and sections; and in so doing the Jury were guided by the scheme of classification published in the Jury Directory.

8. It has been found impossible to avoid a few anomalies in classification, arising chiefly from the following cause:—The division of articles in the first edition of the Official Catalogue was unavoidably to a certain extent imperfect; and, in fact, the inspection of the Jury was in many cases necessary in order to determine to which class an object properly belonged. This Jury, during the earlier part of their proceedings, endeavoured as far as possible to correct those imperfections in classification, by causing some articles to be transferred from other classes to Class VIII., and some articles to be transferred from Class VIII. to other classes. When the time for the completion of the awards, however, came to be near at hand, this Jury considered that to persist in proposing such transfers would be to incur the risk of causing articles to be overlooked altogether while being passed from class to class; and, therefore, during the latter part of their proceedings, they adjudicated upon all articles that came before them, without considering strictly whether such articles properly belonged to Class VIII. or not; and hence a few articles are to be found in their list of awards which might with greater propriety have been classed elsewhere; for example, as "manufacturing machinery" (Class VII.).

9. Before commencing any remarks on special articles or kinds of articles in this subdivision, it may be stated that a large proportion of the honours awarded are granted for such reasons as "good workmanship," "good arrangement," "practical utility," "practical success," &c., and that in such cases, for the most part, it is unnecessary to give any special explanation in addition to the simple statement of the reason in the list of awards. Special explanation is chiefly required in cases where the article contains something new or unusual. Hence it is obvious that the space occupied by special explanations of articles in the sequel of this report is not to be taken as an index of their comparative merit or importance in the opinion of the Jury.

10. Agreeably to the recommendation contained in the first paragraph of page 12 of the Jury Directory, the Jury were most careful in admitting claims of novelty of invention; and in particular they sedulously endeavoured to avoid making any statement or remark which might be construed into an attempt to decide a question of patent right; for they considered that the decision of such questions was foreign to their duties.

11. In conclusion of these general explanations and remarks, it may be stated, that when the machinery of the present Exhibition is compared with that of 1851, it is found to be marked less by originality of invention, or the introduction of new principles, than by improvement in details, workmanship, and material; and that with respect to material in particular, the most striking improvements are those which consist in the greatly extended use of steel, and of iron approaching to steel in its properties.

Special Explanations and Remarks.

Subdivision I.—Prime Movers.

Section I.—Boilers, Furnaces, &c.

With a few exceptions, the actual boilers exhibited (as distinguished from drawings and models) belong to traction-engines, or to portable or semi-portable steam-engines; and those boilers are marked on the whole by efforts made with greater or less success to economize space, and to facilitate cleansing and repairs by means of improved arrangements of the heating surface, or otherwise. The following examples may be cited:—Bray's traction-engine (United Kingdom—1,805), Ransomes and Sims' portable steam-engine (United Kingdom—1,961), J. Taylor and Co.'s traction-engine (United Kingdom—2,004), Tuxford and Son's engines (United Kingdom—2,195), J. F. Cail and Co.'s engine (France—1,144), Farcot and Son's condensing steam-engine (France — 1,152), Hediard's boiler (France — 1,131), Laurens and Thomas' boiler (France—1,151), Zambeaux's portable boiler (France—1,137), Albaret and Co.'s portable steam-engine (France—1,207), Henschel and Son's boiler-tubes (Hesse-Cassel—434).

Many of the boilers are provided with the means of super heating steam, either by passing it through tubes in the smoke-box, or by enclosing the steam-chest in a smoke-box or flue.

In the engine exhibited by Mr. Wenham (United Kingdom—2,019), the steam, after having performed part of its work in a smaller or high-pressure cylinder, is supplied with heat while in the act of expanding during its passage from that cylinder to the larger or low-pressure cylinder. This application of heat to steam is at once sound in principle and successful in practice.

The most new and unusual in form of the boilers exhibited is that by Mr. Harrison (United Kingdom—1,877), which is an American invention. It consists of a number of hollow cast-iron globes, all equal and similar, connected with each other through cylindrical necks or short tubes, the whole being bound together, in a rectangular arrangement, with wrought-iron bolts. A boiler of any required size can at once be made by building and bolting together the proper number of globes and necks. The water and steam are inside, the fire outside.

M. Grimaldi (Italy—1,001) exhibits a cylindrical boiler, containing either flues or tubes for the flame, and turning slowly about a horizontal axis, so as to bring every part of the surface in contact with the liquid water and with the steam alternately, in order to increase the efficiency of the surface in raising steam, and prevent over-heating and corrosion.

The boilers shown by Mr. H. Cater (United Kingdom — 1,814), (presenting a peculiar arrangement of tubes), although they were set up too late to be the subject of an award, may here be mentioned as being at work in the boiler-yard of the western annexe, with satisfactory results.

The following articles fall especially under the head of furnaces and their appendages:—

An apparatus for promoting perfect combustion and preventing smoke, by u ing very small jets of steam to blow streams of air into the furnace, is exhibited by Mr. D. K. Clark (United Kingdom—1,822). Its practical success has been well established. It is at work in the boiler-yard.

Sieburg's improved grate (Prussia — 1,320), and Schulz, Knaudt, and Co.'s fire-box (Prussia —1,318).

In M. Hubazy's portable engine (Austria — 569) the furnace is adapted for the burning of straw—a most useful contrivance where other fuel is scarce.

The apparatus of M. Steenstrup (Norway—213) is intended for the prevention of rust in boilers. The exhibitor takes advantage of the chemical affinity of chloride of calcium for water, so as to dry completely the rust already formed, which consequently falls to powder and detaches itself from the boiler.

The "Hydratmo-Purificateur," or water-softening apparatus, exhibited by M. Durenne (France —1,163), purifies water from salts of lime by the aid of its property of depositing such salts when raised to a high temperature. A rectangular case contains, one above another, a series of horizontal trays or platforms, heated by means of the waste steam of the engine, which enters at the bottom of the case, and slowly ascends. The water to be purified is introduced at the top, and trickles from tray to tray, becoming heated by the condensation of the steam, and depositing part of its salts of lime on each tray, until it is discharged at the bottom of the apparatus, completely softened, and at a high temperature; so that the heat of the steam employed is not wasted. By opening the front of the case the trays are taken out, from time to time, and cleansed. The practical working of this apparatus is most efficient.

Mr. Siemens' regenerative furnace (United Kingdom—1987) is well known through descriptions which have appeared in the Transactions of the Institution of Mechanical Engineers, and the Reports of the British Association for the Advancement of Science.

Section II.—Land Steam-Engines.

Of the land steam-engines, some are fixed, or semi-fixed, some portable, and some are road locomotives, or "traction-engines."

Amongst the fixed and semi-fixed engines, although a few good examples of beam engines and vertical engines are to be found, the horizontal construction generally prevails; probably owing to the ease and convenience with which all parts are accessible. In some cases, as in the machinery of Messrs. Manlove, Alliott and Co. (United Kingdom—1,924) and Messrs. Whitmore and Son (United Kingdom—2,023), a horizontal engine is used to drive a vertical shaft directly, which is a good arrangement for corn-mills and centrifugal machines.

Many of the steam-engines are employed to drive machinery belonging properly to other classes; and in such cases it is the steam-engine alone that falls under the consideration of the Jury of Class VIII.

In other cases the steam-engine drives some piece of mechanism, such as a hoist, a crane, a pump, a blowing-machine, &c., belonging to a different sub-division of Class VIII., and in such cases any explanation which may be required of the machinery so driven will be found in the proper sub-division of this report.

With respect to the steam-engines in the present Exhibition, as compared with those of 1851, it may be observed that they show an increased employment of high pressure, great expansion, and super-heating, an increased use of surface condensation (generally effected by means of a great number of small horizontal tubes), a tendency towards simplicity in the framing and main moving parts, a general abandonment of devices that are more curious than useful, and a higher perfection of workmanship and finish; all of which improvements combine to produce greater economy of fuel, power, and repairs.

Setting aside merit of a kind that does not require special explanation, such as simplicity, good workmanship, practical success, &c., the following remarks may be made as to those engines which present new and unusual features:—

Manlove, Alliott, and Co. (United Kingdom—1,924) exhibit a pair of horizontal engines, for working centrifugal machines, which are placed with their cylinders bottom to bottom on one frame; so that the tendency to strain the frame, which arises from the inertia of the moving parts, may be balanced by making the pistons move in opposite directions.

The double-cylinder expansive engine, in various modifications, is numerously represented. In the engine of Mr. Wenham (United Kingdom—2,019) the steam is superheated in its passage from the small to the large cylinder (see Section I.) In Messrs. May and Co.'s engine (United Kingdom—1,927) the dead-points are done away with by placing the cranks of the large and small cylinders at right angles to each other; the steam being exhausted from the small cylinder into a wrought-iron reservoir, jacketed with high-pressure steam from the boiler.

In one of the engines exhibited by Carrett, Marshall and Co. (United Kingdom—1,813) the dead point is passed (though its effect is not wholly done away with) by placing the cranks of the small and large cylinders not directly opposite each other, but at a very obtuse angle. (This arrangement has also been employed in Craddock's engine.) The opposite, or nearly opposite motion of the large and small pistons is well known to be favourable to balance of inertia, and also to a good distribution of the steam, by enabling it to pass in the most direct manner from either end of the small cylinder into the adjoining end of the large cylinder. In the drawing of M. Delandtsheer's engine (Belgium—265), the cranks for the large and small cylinders are exactly opposite in direction, and the dead points are done away with by combining a pair of engines with cranks at right angles to each other in the usual way.

The end-to-end double cylinder arrangement is exemplified in the engine of M. Scribe (Belgium—278), and in a model in the United Kingdom division, which is not numbered nor mentioned in the catalogue.*

For producing variable expansion, the system most frequently employed is the ordinary link motion; and next in order as to frequency, the link motion with a separate expansion valve driven by a third eccentric. In Messrs. Ferrabee's engine (United Kingdom—1852) the expansion-valve is driven by a straight-link motion of its own, worked by means of two eccentrics, on a shaft, which is made to turn at double the speed of the engine-shaft by means of a pair of toothed wheels.

In many cases also, and especially in the foreign engines, the variable expansion is produced by means of the compound slide, regulated in some cases by hand, and in others by the governor; and amongst the latter class may be specified the engines of the Magdeburg-Hamburg Steam Navigation Company (Prussia—1,312), the Sprottau Iron Works (Prussia—1,321), Farcot and Co. (France—1,152), C. T. Porter (United States—29). In Messrs. Farcot's engine, the action of the governor upon the variable expansion is very exact and perfect, owing mainly to the construction of the governor, in which, by a peculiar mode of suspension and counterpoise, there is obtained a sufficiently accurate practical approximation to the theoretic accuracy of the parabolic governor, but without its complexity and liability to derangement. (For details, see the report of M. Tresca to the Société d'Encouragement pour l'Industrie Nationale, published in their Bulletin for 1861.) In the governor of Mr. Porter's engine a similar result is obtained by using light balls and a high speed, with a heavy vertical load to balance the great centrifugal force. The figure and movement of the slide-valve in this engine are a peculiar kind, suited to open and close rapidly with a comparatively small travel.

The pumping engines of Mr. Steele (United States—38) and of Mr. Worthington (United States—28) are remarkable as being engines of rapid stroke without fly-wheels. In the former there is a single cylinder, whose slide-valve is moved when the piston is at its dead points, by an apparatus which is in fact equivalent to a small auxiliary steam-cylinder. In the latter there are a pair of equal cylinders, working at half a stroke behind each other, the slide-valve of each cylinder being shifted by the piston of the other.

In M. Schentz's rotatory steam-engine (Sweden—272) the advantages of simplicity and compactness which the rotatory engine is admitted to possess, are combined with the power of working expansively in a very perfect manner; while at the same time the disadvantages of engines of that class are to a great extent overcome; for the pressures at the shaft are balanced, the sliding-valves or pistons are relieved of pressure while they are passing the stops; and the steam-tight bearings, when worn, can all be tightened at one operation, in consequence of the conical form of the casing.

The North Moor Iron Foundry (United Kingdom—1,948) exhibit a steam-turbine, which has been found to work efficiently, and which is convenient for driving fans, the fan and turbine being fixed on the same shaft. Mr. Bourdon (France—1,156) has a turbine driven by a current of water, which is itself driven by a steam jet.

Of the single-acting Cornish engine one example only appears, represented by the model of Messrs. Harvey and Co. (United Kingdom—1,880).

The traction-engines to which awards have been made by this Jury are those exhibited by Bray's Traction Engine Company (United Kingdom—1,805), J. Taylor and Co. (United Kingdom, 2,004), Tuxford and Sons (United Kingdom—2,195). It is well known that, although steam-carriages for common roads are of old date, traction-engines, or road-locomotives, are of recent introduction. All the three engines above mentioned work well in practice.

Mr. Bray's is capable of acting as a portable steam-engine, a steam-crane, or a fire-engine, at will; the rim of each of its two driving-wheels is furnished with blades or spades, which can be pushed out or drawn in, according to the steepness of the road and state of its surface and the load to be drawn, so as to give just the required hold and no more. Messrs. Taylor's is marked by the merit of great simplicity. It has two driving-wheels, six feet in diameter, without blades. Messrs. Tuxford's has a single roller instead of driving-wheels; its engine is well protected against injury by dirt, and the engine-driver and steersman are together.*

Section III.—Marine Steam-engines.

The general remarks as to progress since 1851 which have been made in Section II., as to land engines, are applicable to marine engines also. The improvements in workmanship are even more striking.

A very large number of the marine engines exhibited possess merit of a high order, as this Jury have testified by their awards. They have also indicated briefly in the reasons given for the awards, the particular kind of merit by which each engine is most distinguished.

Of the marine steam-engines, by far the greater number are horizontal screw engines, the reason probably being, that such is the arrangement best suited for ships of war, and that the engines of ships of war can more easily be spared for purposes of exhibition than those of merchant ships.

The horizontal engines are numbered as follows:—United Kingdom, 1,891, 1,902, 1,926, 1,955, 1,964, 2,632 (model), 1,897, 1,962 (model); France, 1,132, 1,195; Sweden, 274. In this form of engine the space is more limited than in any other, and difficulties are thus caused which the skill of the engineer is exerted to overcome in various ways. Hence arise great varieties in the details of the designs of horizontal engines. For example, the engines of Humphrys and Tennant (United Kingdom—1,891) are marked by simplicity and accessibility; the action is direct, the stroke and connecting-rod short, and the cylinder of large diameter. In other examples, a longer stroke and connecting-rod are obtained in various ways: in those of Maudslay, Sons, and Field (United Kingdom—1,926), Ravenhill, Salkeld, and Co. (United Kingdom—1,962), Nouvelle Société des Forges et Chantiers (France—1,195), A. W. Frestadius (Sweden—274), and others, by double piston-rods; in that of E. Nillus (France—1,132) by double piston-rods connected with trunks in the air-pump, a construction which is also used in Britain; in that of G. Rennie and Sons (United Kingdom—1,964) by trunks in the cylinders; in that of J. Penn and Sons (United Kingdom—1,955) by trunks passing completely through the cylinders, &c.

A peculiar arrangement of a duplex horizontal trunk-engine, in which the inside of the trunk is made available as cylinder-space by the aid of a fixed piston, is represented by a model, in the British division of the western annexe, which is not mentioned in the catalogue. (Exhibited by Mr. E. E. Allen.) The engine of M. Frestadius (Sweden—274) has concentric double cylinders.

Amongst oblique screw-engines may be mentioned those shown in the drawings of Armengaud (France—1,181) and of Randolph, Elder, and Co. (United Kingdom—1,960) the latter of which arrived too late to be adjudicated upon).

As examples of the vertical inverted-cylinder screw-engine, so well suited for merchant ships, the engines of Morrison and Co. (United Kingdom—1,936), Tod and M'Gregor (United Kingdom—2,009), and Richardson and Sons (United Kingdom—1,965) may be noticed, as well as a model exhibited by Humphrys and Tennant (United Kingdom—1,891), which will be again mentioned further on. The first three of these have surface condensers, the first two with horizontal, and the third with vertical tubes. The first two are very compact and convenient in their arrangement; the third may be regarded either as a working model or a pair of small engines. The steam, before entering the surface condenser, gives out much of its heat to the feed-water, which traverses a set of tubes surrounded by the exhaust steam.

The engines of Maudslay & Co. are accompanied by a very complete and well-executed set of moving models of marine engines, of a great variety of kinds, both paddle and screw.

The engines of Humphrys & Tennant are accompanied by moving models of themselves, and also of a pair of vertical screw engines, noted for their efficiency and economy in practice, being those of the "Mooltan." These are double-cylindered expansive engines, each small cylinder being directly on the top of its large cylinder.

Paddle engines are represented by working models by Maudslay, Sons, & Field (United Kingdom—1,926), J. Penn & Sons (United Kingdom—1,955), and Ravenhill, Salkeld, & Co. (United Kingdom—1,962), and the drawing of Messrs. R. Napier & Sons (United Kingdom—1,939). The model of Messrs. Ravenhill has feathering paddles and oblique cylinders, while that of Messrs. Penn has oscillating cylinders. The only pair of full-sized paddle engines are exhibited by Messrs. Escher, Wyss, & Co. (Switzerland—104).

The valve gear and expansion gear of the marine engines are very various. For reversing, the link motion is used in almost every case: an exception is found in the engine of the Mediterranean Company above referred to (France—1,195), where the engine is reversed by a piece of wheelwork, which, when acted upon by hand, causes each eccentric to reverse its position on the shaft that carries it. In Humphrys and Ten-

* Exhibited by Mr. E. E. Allen.

* Mr. Yarrow's steam-carriage (United Kingdom—2,033) was included in Class VIII. of the Catalogue, although its place would have more properly been in Class V., (see Jury Directory, page 63). The Jury of Class VIII. examined it, and formed a very favourable opinion of its merit so far as that could be ascertained by mere inspection. They were at first desirous of having its performance practically tested on some road near the Exhibition; but they were induced to desist from considering it further by the belief that it was about to be transferred to the class to which it properly belonged. Unfortunately, that belief was erroneus; and the steam-carriage in question has not been the subject of any award.

nant's engines an improvement in the construction of the link has been carried out, by making it of a single bar embraced by a slider, instead of a pair of bars with a slider between them.

In some examples, the link motion is used for expansive working; but in most the cut-off is effected by means of a separate expansion valve, the mechanism for working which presents a great variety of designs.

Amongst various peculiarities of arrangement, may be noted that of the pair of horizontal screw engines of Messrs. Rennie, in which the cylinders are at opposite sides of the shaft; each cylinder is directly opposite the air-pump of the other; and each cylinder exhausts directly into the condenser by its side, so that exhaust-pipes bridging over the shaft are dispensed with.

The horizontal trunk marine screw-engines of Messrs. Penn, being exhibited by a member of this Jury, could not be made the subject of an award. They are accompanied by a model, already referred to, and by separate parts of engines, showing great perfection of material and workmanship.

Section IV.—Windmills.

The windmill of Wentworth and Jarvis (United States—54) is chiefly remarkable for its regulator, which consists of a pair of slightly diverging vanes forming a sort of tail behind the cap of the windmill, and so connected with the sails, that when the vanes, by the increased impulse of the wind, are pressed closer together, the sails are turned into a position that exposes less surface to the wind.

Section V.—Water-wheels and Turbines.

The conditions to be fulfilled in order that the efficiency of a turbine, or water-wheel of any other kind, may be the greatest possible, are that the water shall begin to act on the wheel without shock, and shall leave it with no more velocity than is necessary in order to prevent the wheel from being choked with back water. All the turbines to which honours have been awarded by this Jury are capable of fulfilling those conditions when properly managed.

Turbines have been classed according to the general direction of the flow by which the water is carried through the wheel, independently of the whirling motion which is first impressed on the water by the guide-blades, and afterwards taken away during the action of the water on the wheel. According to this mode of classification, those of the North Moor Foundry Company, Schiele's (United Kingdom—1,941), and of Fontaine & Brault (France—1,173) are "parallel-flow" turbines, because the general flow of the water is parallel to the axis; and that of Williamson Brothers, Thompson's (United Kingdom—2,026), is an "inward-flow" turbine, because the general flow is towards the axis. In order that the conditions of greatest efficiency may be fulfilled with different loads, the mode of varying the quantity of water supplied ought to be such as to change as little as possible the speed of the whirling component of its motion. This is effected in parallel-flow turbines by supplying the water through a ring of orifices, a greater or less number of which are completely closed when the supply is to be varied, so that all the orifices which are open are fully open. In the inward-flow turbine or "vortex-wheel," the same object is obtained by varying the obliquity of the guide-blades.

The drawing of M. Sagebien (France—1,154) represents a water-wheel which, on theoretical grounds, may be considered advantageous for low falls; but the Jury had not, during their proceedings, sufficient data to enable them to make an award upon it.

Section VI.—Water-pressure Engines.

The water-pressure engines of Sir W. G. Armstrong and Co., (United Kingdom—1,785) are capable of working and standing still at intervals without waste of power or of water. This, in the absence of a reservoir, is effected by the aid of the "accumulator," being a cylinder like that of a hydraulic press, having a plunger loaded according to the pressure to be maintained, and being large enough to contain the store of water which collects when the machinery is at rest, and to supply the surplus of water required when the machinery is moving. One of the engines consists chiefly of a cylinder and piston of long stroke for working a hydraulic crane through pulleys and chain-tackle; another is an engine for producing rotatory motion at high speeds, with three oscillating cylinders, having plungers which act upon three cranks, making angles of 120° with each other. This engine is characterized by the use of "relief clacks;" those are valves which, upon the occurrence of any tendency to excessive increase or diminution of pressure in the cylinder, permit water to flow back from the cylinder into the supply-pipe, or from the discharge-pipe into the cylinder, as the case may be, and thus prevent shocks without wasting water.

Carrett, Marshall, and Co. (United Kingdom—1,813) exhibit a double-acting water-pressure engine specially adapted to the blowing of organs, in which the piston moves with a uniform speed, and there is no fly-wheel.

The water-wheel exhibited by Mr. E. O. Richard (Canada—119) is really a kind of rotatory water-pressure engine.

Section VII.—Vacuum-Power Engine.

The Jury could find no engines to which the above description seemed to be applicable.

Section VIII.—Electro-Magnetic Motive-Power Engines.

Some engines of this kind were exhibited, in which much ingenuity was displayed; but inasmuch as the Jury had no opportunity of ascertaining the convenience and efficiency of those machines while working, either by inspection or from the information of others, they did not conceive themselves warranted in making any award upon them. It is well known that certain electro-magnetic engines are at present in extensive practical use for driving small machinery in which the cost of motive-power is unimportant; but no specimen of those engines was exhibited. The electro-magnetic engine of D. McCallum (United Kingdom—1,916) was carefully searched for, but not found.

Section IX.—Miscellaneous Prime Movers.

The gas-engines of C. W. Siemens (United Kingdom—1,987), and Lenoir and Co. (France—1,188) are driven by the combustion of a mixture of coal-gas and air so proportioned as not to be dangerously explosive; the mixture is fired at each stroke by an electric spark. From the report of M. Tresca on Lenoir's engine, it appears that this engine is not economical of fuel as compared with a steam-engine, but that it is very convenient and useful for driving machinery in situations where a steam-engine cannot be employed. Siemen's engine is provided with a regenerator for saving a great part of the heat which would otherwise be discharged with the waste gasses; and there are theoretical grounds for expecting it to be economical; but precise experimental and practical data as to its economy and efficiency do not yet exist.

The engine of E. B. Neill (United Kingdom—1,943), and the engine in the United States without a number, are both hot-air engines of a kind invented by Captain Ericsson. Those exhibited by C. H. Dennison (United States—32), and that of Schwarzkopf (Prussia—1,319), are also hot-air engines. No advantage in point of economy over the steam-engine is claimed for any of these, their proper use being, like that of the electro-magnetic engine and the gas-engine, to furnish a convenient motive power for small machines where a steam-engine cannot be employed. As the working of these engines within the Exhibition building would have been inconsistent with the regulation which prohibits the lighting of fires in it, the Jury, in order to satisfy themselves that the engines worked in a smooth, steady, and manageable way, obtained from Her Majesty's Commissioners permission for the exhibitors to remove them for a time from the building, and set them to work outside. The results were satisfactory in the case of the two American engines; but the Prussian engine was unfortunately prevented, by accidental circumstances, from being set to work until after the proceedings of the Jury were closed, so that they could not make any award upon it. It was afterwards, however, set to work in the boiler-yard, when it moved smoothly and steadily, and was easily started and stopped. Both the American engines take in at each stroke a fresh supply of air, which is afterwards discharged; Schwarzkopf's engine retains the same air permanently, and transfers it back and forward between the hot and cold end of a receiver alternately.

W. J. Macquorn Rankine,
Reporter.

Subdivision II.—Separate Parts of Machines, Specimens of Workmanship, Miscellaneous Pieces of Mechanism.

Section I.—Heavy Castings or Forgings in the Rough; Castings or Forgings, Plain, Intricate, or Beautiful, in the Rough.

As compared with articles under these heads exhibited in 1851, we consider there is a decided improvement; few, however, are exhibited in this class as abstract specimens, but are for the most part portions of the machines; there are nevertheless some excellent specimens of forgings of very large dimensions, and which owe their excellence in finish and soundness mainly to the facility afforded in their construction by the application of the Nasmyth and other steam hammers; some of the large forged shafts are put together in longitudinal segments, which is another reason for their soundess. A complete revolution in the manufacture of large forgings has been effected by the steam hammer. The castings of large marine engine cylinders and other parts, the crank shafts, cross heads, connecting rods, &c., in wrought iron, as shown in the present Exhibition, are such as never were produced of equally good quality on any former occasion.

Fr. Krupp, Essen (Prussia—1,308).—This exhibition includes the largest block of steel in the Exhibition; also some excellent specimens of cast-steel axle-trees, and other first-rate specimens of steel manufacture. Medal awarded for excellent workmanship and material, practical success, general excellence.

Horder Mining and Forging Company (Prussia—1,258).—Weeel forgings, locomotive tires of puddled steel, wrought-iron telegraph poles, &c. Honourable mention, very good work.

Petrarsa Royal Works (Italy—1,058).—A large wrought iron shaft for screw propeller, very good specimen of plain forging. Honourable mention.

Under the above heads, the Jury wish to call attention to a beautifully-forged and finished cross head for a marine engine, being one of a pair for the "Agincourt," 1,350 horses power; also a connecting rod of similar powers by Messrs. Maudslay, Sons, and Field. The above is not separately designated in the catalogue.

Also to a double-crank shaft for engines of 1,250 horses power by Messrs. Penn and Son, of Greenwich, excellent both as a forging and a finished piece of work, and to the casting of a cylinder which is exhibited in the state in which it left the sand, and without having had any subsequent workmanship bestowed upon it. A most beautiful specimen of loam casting. The above are not separately designated in the catalogue.

Section II.—Specimens of Turning in Metals.

The preliminary remarks of the last section apply with equal force to the different portions of steam-engines and machinery in general, inasmuch as by the improved construction of slide lathes, planing, slotting, and grooving machines, work is produced of the most superior description.

In the construction of all machines and machinery by the best makers, the great aim evidently now is, to introduce such forms as can be obtained by power tools, without the use of the hand-chisel and file, and the result is increased elegance and simplicity, combined with great economy. It is necessary to point out where these results are most striking, as the awards of the Jurors have already shown their appreciation of them.

One specimen alone of turning and finishing in glass is shown, and this is both practical and new.

J. Chedgey, Southwark (U. K.—1820).—Glass-rollers, pumps, and pipes turned and bored.

New manufacture and good work. The only articles of the kind in the Exhibition. Here is exhibited a household mangle with glass bed and rollers. Medal awarded.

Section III.—Specimens in Filing and Finished work in metals, such as Surfaces, Irregular Figures, &c.

Broughton Copper Company, Manchester (U. K.—1,808).—Copper and brass work valves, &c., copper rollers for calico printers, and brass tubes for locomotive engines of very superior quality and workmanship are exhibited by this firm. Medal awarded.

Eadie and Spencer, Glasgow (U. K.—1,843).—Iron tubes for boilers. Medal awarded for good workmanship.

Imperial Iron Tube Company, Birmingham (U. K.—1,894). Metal tubes. Medal awarded for good workmanship.

Newton Keates and Co., Liverpool (U. K.—1,944).—Copper and brass articles for engineers. Medal awarded for good workmanship.

J. Russell and Sons, Wednesbury (U. K.—1,975).—Tubes and fittings, most excellent specimens. Medal awarded for good workmanship.

Stephenson Tube Company, Birmingham (U.K.—1,994).—Seamless metal tubes, rollers, &c. This firm have a most interesting exhibition, and claim great advantages as regards toughness of material from the combination of phosphorous in the manufacture of their metal. The Jurors speak in high terms of the whole exhibition. Medal awarded.

A. Everett and Sons, Birmingham (U. K.—1,848).—Brass, copper, and iron articles, tubes, &c. Honourable mention.

Lloyd & Lloyd (U. K.—1,912).—Wrought-iron tubes and fittings. Honourable mention. Some excellent specimens of workmanship are here exhibited in forgings of wrought-iron junctions for gas, having a great number of outlets on the same piece.

Russell and Co., London and Manchester (U. K.—1,974).—Wrought-iron tubes, &c. Honourable mention.

Section IV.—Valves, Cocks, Pistons, Governors, Driving Bands, &c.

Most excellent articles are exhibited under these heads and by a large number of exhibitors. The valves and cocks are both good in design and constructed of materials well suited to the purpose. Metallic pistons are now exhibited having great facility of accurate adjustment against the sides of the cylinders, so as not to cause more friction than is absolutely necessary for preventing the passage of steam, and of very simple construction, and not liable to derangement. Governors are in great variety, but in most cases they partake of the objections to the ordinary ball and pendulum governor, viz., that they do not give a proportionate amount of steam for a varying load, with a maintenance of uniform speed; still in some cases this desideratum is obtained, and the examples are noted and described under their respective numbers. A decided improvement in driving bands is shown, both as regards materials and mode of construction, in leather, india-rubber, &c.

Valves and Cocks.

Baines and Drake, Glasgow (United Kingdom—1,788).—Engine and boiler mountings. Honourable mention.

J. Beck, Southwark (United Kingdom—1,796).—Valves and cocks. These include some very conveniently arranged angle-placed valves as cocks, and the work and finish are very good. Honourable mention.

E. T. Bellhouse and Co., Manchester (United Kingdom—1,797).—Brass fittings. Honourable mention.

J. J. Silbermann, Paris (France—1,162).—Air-pump valve. Honourable mention.

F. Allen, jun. (United States—29).—As inventor of slide-valves, valve gear, and expansive gear, exhibited by C. T. Porter. By a peculiar arrangement of levers actuating on a slide cut-off valve at the back of the ordinary steam and exhaust valve, a very simple mode of expansion is obtained with great variation. Medal awarded.

S. Leoni, St. Paul's-street, N. (United Kingdom—1,909).—Taps, steam-cocks, bearings for machinery. These have not yet been sufficiently tested to prove their superiority, but appear to to work with little friction. The substance "Adamas" consists of silicate of magnesia, calcined, moulded, and baked to any required shape, and appears to possess peculiar anti-friction properties.

Driving Bands.

North British Rubber Company, Edinburgh (United Kingdom—1,947).—Driving belts, &c. These are said to be very durable, and have more adhesion than leather. Medal awarded for practical utility and success.

C. A. Preller (U. K.—1,959).—Untanned leather driving-belts, &c. In the leather bands made from ordinary leather, where extra strength is required, this is obtained by one or more thicknesses stitched together, which is objectionable, inasmuch as passing over pulleys of small diameter the different layers are at different degrees of tension, and increased wear and friction are the result; this is avoided in a great measure in the driving-bands exhibited by Mr. Preller, who obtains great increased strength by his peculiar manner of preparing the leather, giving extra strength and suppleness, and thus rendering the double strap in most cases unnecessary, and, when actually required, the objection is not so great as with leather prepared in the ordinary way, on account of the thinness and suppleness of the former. Medal awarded for good workmanship and new manufacture.

Webb and Son, Stowmarket (United Kingdom—2,017).—Leather driving-belts, buckets, hose, &c. A very creditable and useful exhibition. Medal awarded for good workmanship.

C. J. Edwards and Son, London (United Kingdom—1,845).—Leather bands, hose, and fire-buckets. Medal awarded for good workmanship.

Hepburn and Sons, Bermondsey (United Kingdom—1,882).—Machine belts and other articles of leather. Honourable mention.

J. Holgate and Co., Southwark (United Kingdom—1,885). — Leather mill-bands and hose-pipes. Honourable mention.

Nobes and Hunter, Borough (United Kingdom—1,945).—Leather bands, hose, buckets, &c. Honourable mention.

W. Potier, Blackfriars-road (United Kingdom—1,957).—Gut wheel-bands. Honourable mention.

M. J. Bleyenheuft, Eupen (Prussia, 1,287a).—Leather machine-straps, buckets, hose, &c. Medal for good workmanship.

J. H. Bleyenheuft (Prussia, 1,287).—Leather machine-straps, cord, hose, &c. Honourable mention.

W. Ruland, Bonn (Prussia, 1,315).—Leather for machine-straps. Honourable mention.

Farcot and Sons, Port St. Owen (France, 1,152).—Governors with crossed arms, arranged so as to overcome in some measure the objection to the ordinary ball-governor, by making it more accurate for varying amount of load upon the engine. Medal awarded.

A. B. Albaret and Co. (France, 1,207).—This consists of a fly-wheel mounted on a movable centre, which enables it to be set at different angles with regard to the line of its own axis; when revolving, the tendency is to move to a position at right angles with its axis, and in so doing to act up the throttle-valve.

Governors.

C. T. Porter (United States—29) exhibits a governor having double elbow arms, the tendency of which is to raise a weight vertically upon the spindle. This governor is very sensitive, and mainly owes it to rapid rotation, which its peculiar construction requires. Mr. Porter also exhibits another governor, particularly applicable for marine engines; this is also a centrifugal ball-governer, but the centrifugal force of the balls is met by a spiral spring, and is thus described by the exhibitor:—"The novel feature in this governor, and that which gives to it its value, is the initial compression of the spring; for example, the spring is compressed two inches by the nut on the spindle. The circle in which the centres of the balls revolve is ten inches in diameter, expanding to one of fifteen inches in diameter. This expanding motion of the balls produces a further compression of the spring of one inch. The balls are shown in the engraving half expanded, and the spring, if released, would be two and a half inches longer than it appears. It will be observed that the expansion of the balls adds fifty per cent. to the diameter of the circle which they at first described, and also fifty per cent. to the original compression of the spring. If, therefore, the centrifugal force of these balls and the resistance of the spring are in equilibrium in any position, they will be so also in every other position, the number of revolutions per minute remaining the same. The resistance varies, by the increase or decrease in the compression, precisely as the force varies by the expansion or contraction of the circle."

M. A. Soul (United Kingdom—1,992) exhibits a governor which may be thus described:—A fly-wheel having a long boss with a spiral groove cut in it, is placed upon a hollow spindle with a straight groove in it; inside said spindle is another which carrres a pin as a driver to the fly-wheel; if the spindle or shaft overrun the fly-wheel, the interior spindle is moved in or out as the case may be, and the movement is communicated to the throttle-valve.

Schiele's governor, exhibited by the North Moor Foundry Company (United Kingdom—1,948), acts by water-pressure upon a piston, given by a centrifugal pump. This governor can be made to exert great force, so as to be capable of acting directly upon the sluice or clow of a water-wheel or other large valve; under ordinary circumstances where great sensitiveness is required, an elastic diaphragm may be used instead of a piston.

J. Hick,
Reporter.

Subdivision III.—Pneumatic Machines.

Section I.—Air-pumps.

These pumps are principally represented by exhausting machines for creating a vacuum for the evaporation of syrups in the manufacture of sugar. They are constructed on a nearly uniform model. Each has a vertical steam cylinder, with beam, connecting-rod, and fly-wheel; the pumps, two or four in number, and made of gun-metal, are placed on either side of the beam. The construction of this kind of machine has been scarcely modified for many years.

We place in this class the exhausters constructed by Messrs. Gargan and Co. (France—1,031), for the drawing of coal gas from the retorts. These machines are represented by excellent drawings by M. Fouché. It is known that in large gas works it is usual, for the prevention of waste, to pump the gas from the retorts, in order that the pressure therein may not be raised above that of the atmosphere, whilst it is delivered into the gasometer with the necessary pressure. Blowing-fans have also been employed with the same object. Messrs. Gargan have constructed exhausting machines with three parallel double-action cylinders, driven by a steam-engine. The employment of these three pumps, which draw from a small regulating gasometer, is sufficient to maintain a very regular current of gas. These machines, which offer a great economy of motive power over blowing-fans, have been adopted by the Gas Company of Paris.

An ingenious instrument of Mr. J. J. Silbermann (France—1,162) was remarked. It is an air-pump for physical and chemical researches. It is furnished with a stop-cock, pierced with several openings, arranged in such a manner that the pump, which is in communication with three receivers, can pump the gas either in or out of

each of the three receivers into the other two at the will of the operator by simply turning a stop-cock.

SECTION II.—BLOWING-FANS.

Among the blowing-fans exhibited may be remarked those of Mr. G. Lloyd (United Kingdom—1,913), and Mr. T. Lemielle (France—1,135). The former was in the Exhibition of 1851. Both in Paris in 1855. The first is composed of blades, the width of which decreases from the centre to the circumference. These blades are contained within two cheeks, forming one body with them, and assuring the complete carrying away of the enclosed air. The absence of lateral leakage accounts no doubt for the comparative noiselessness of the action of the machine.

The blowing-fan of Lemielle, the action of which produces air-chambers of various capacity, acts rather like a piston machine; it continues to furnish excellent results in the ventilation of mines, and it is employed as an air blast in many large works.

The North Moor Foundry Company (United Kingdom—1,941) has exhibited a blowing-fan patented by Messrs. Schiele and William, consisting of a fan having its wings curved and of diminishing width, mounted on the same shaft with a steam turbine, which drives it. This fan is particularly applicable to the ventilation of steam and sailing vessels.

The Vienna Imperial and Royal Commission for the Ventilation of Military Hospitals (Austria—630) exhibits a ventilating fan of Dr. Heger. This instrument consists of a wheel, having the same axis as the tube which encloses it, and having blades inclined to this axis, it will be evident that the rotary movement of the blades sets in motion the air within the tube. The variable sections of the tube and of the openings for the passage of the air are arranged in a manner to diminish as much as possible the loss of motive power.

From the reports furnished, this machine appears to have attained a useful effect of 55 per cent. of the power employed, which is considerable for a ventilator.

SECTION III.—BLAST ENGINES FOR FURNACES, ETC.

The blast engines exhibited are very few. The vertical beam engine continues to be preferred in England. A blast engine of very fine workmanship is exhibited by the Lilleshall Company (United Kingdom—1,910).

A double horizontal engine on the system of W. Fossey, is exhibited by M. L. Pérard (Belgium—273). The admission and expulsion of the air take place through circular slides placed at the bottom of the blowing cylinders, which are pierced with sixteen openings radiating from the centre; the slides have similar openings. In turning round their centre the slides open and close simultaneously all the openings in the bottom of the cylinders; thus is obtained a large area for the admission of air with a slow movement of the valve, which only makes one turn for sixteen made by the machine. During the period of the delivery of air, the pressure on the slides is in a great measure compensated by the pressure of the air circulating in a false bottom, which prevents the separation which would be produced in spite of the guides between the slides and the bottom of the cylinders. At a speed of seventy turns per minute, this machine can deliver 150 cubic metres of air, at a pressure of eight or ten inches of mercury. Like the blast engine of Messrs. Laurens and Thomas, this machine is free from the shocks of the valves, notwithstanding the great speed of the pistons, but it presents over its predecessor these advantages, viz., that the speed of the slides is low, and that the pressure on the different parts is balanced, and from this reason they are not so likely to get out of order.

Mr. Holmgren (Sweden—269) has exhibited a model of a blowing-machine of three single-acting vertical blowing cylinders; the driving shaft is placed below, and the connecting rod is composed of four diverging pieces of wood directly attached to the piston. The different positions of the piston are not parallel with each other; if it were replaced by a sphere of the same diameter as the cylinder, it would have an action theoretically as perfect as that of a cylindrical piston. To profit by this property there has been provided for the piston a spherical fitting, and the connecting rod lengthened as much as possible to diminish the extent of the oscillations of the piston.

Mons. J. Schaller (Austria—561) exhibits forge bellows, and a portable forge with double-acting bellows of a cylindrical form, and enclosed in a square case of sheet iron, having on the upper part the fireplace and a small hood.

SECTION IV.—MISCELLANEOUS.

Under this head are arranged a certain number of machines belonging to the Class VIII., but which it is difficult to distribute in the different sections of the class as defined by the Jury Directory. In the first place is the apparatus of Dr. Normanby (United Kingdom—1,946), for the production of fresh water from sea water. The water is distilled by the steam from the boilers of the steam ship, or from a special boiler in sailing ships.

The apparatus is disposed in such a way as to retain along with the steam from the evaporated water all the air previously dissolved in this water and in that which is employed in condensation, which in the upper part of the condenser nearly reaches the boiling point. This total quantity of air exceeds that which fresh water can hold in solution, so that the condensation produces water perfectly aërated. The empyreumatic taste occasioned by the distillation has still to be got rid of, and this, it appears, is successfully accomplished by filtration through wood charcoal. The whole apparatus is simply and practically disposed; the evaporation is entirely self-acting, requiring only the regulating of some stop-cocks.

The machines for the manufacture of aërated waters are very numerous, and are generally well constructed. It could hardly be otherwise with the manufacturing machinery required by an industry which becomes daily more extended.

M. Heckmann (Prussia—1,303) has exhibited an evaporating pan of large dimensions, for the boiling of sugar in vacuo, 3 metres diameter, and 3·60 metres high, and of very good workmanship.

M. F. Legal (France—1,157) has sent the model of a similar sugar vacuum pan, with some peculiar modifications to avoid the carrying over of sugar with the steam.

Subdivision IV.—Hydraulic Machines, Cranes, &c.

SECTION I.—HYDRAULIC MACHINES, PUMPS, AND FIRE-ENGINES.*

The different systems of pumps are represented in great number. Among the chain-pumps may be remarked that of Mr. J. U. Bastier (United Kingdom—1,792), formed by a series of circular pistons in caoutchouc, moving in a tube of iron enamelled on the inside. To avoid friction the pistons have a diameter somewhat smaller than that of the tube, which itself is slightly narrowed at the lower part, sufficient to allow the pistons to pass with slight friction, thus preventing all loss of water. This apparatus is easily fixed; but we think, nevertheless, that the other pumps would be preferred for great quantities of water, or for great depths.

Murray's chain-pump, exhibited by Mr. Middleton (United Kingdom — 1,930), formed of plates of wood firmly connected together with iron chains, and moving in a rectangular case or trunk, is easily set up for temporary drainage purposes.

The force and lift pumps are in great variety; a large number of constructors have sought to give to the water-ways and valves dimensions which render as small as possible the loss of power by friction. They have also sought to give a continuous movement to the ascending column of water, independently of the action of the reservoir of air. This result is obtained in the pump of Messrs. Carrett, Marshall and Co. (United Kingdom—1,813). The solid piston is worked by a rod of half the section of the piston itself; during the up-stroke the upper surface forces a volume of water into the ascending column, and the lower surface draws in twice that volume. In the down-stroke these two volumes are sent into the receptacle communicating with the upper surface of the piston. One of the volumes here fills the space which would otherwise be left empty; by the descent of the piston the other volume is sent into the rising tube. These pumps, which are of small size, are only exhibited as donkey pumps, for the continuous feeding of steam boilers with water.

The uniform movement of the water is obtained in a still more simple manner in the pump of Messrs. Farcot and Sons (France—1,152), in which two equal pistons with valves affording very large waterways, work parallel to each other in two pump cylinders. During the successive strokes the first piston draws in water by its upper surface, and delivers it to the ascending column by causing it to traverse the second piston. In its ascending course the second piston raises in its turn the column of water by its upper face, whilst the lower face sucks the water, causing it to traverse the first piston. This pump has yielded all the good results promised by its ingenious construction, and it is adopted in the water supply of Paris.

M. Letestu (France—1,167) exhibits pumps which are already very well known, as well as a double pump of large dimensions for drainage purposes. It is chiefly in operations where the waters are charged with mud or gravel that the pumps of M. Letestu have been found most useful.

The pump of Messrs. Knowelden and Co. (United Kingdom—1,901) has the general disposition of a fine engine pump, but between the extremity of the piston and the valves is a diaphragm; the free space between the piston and this membrane is filled with water covered with a layer of oil, so that the greasing of the piston is always perfect, and no sort of liquid nor foreign body can interrupt the action of the piston. The four valves, inlet and outlet, are arranged on the same bed plate, and can be easily visited and repaired. Their grouping presents this advantage, that by turning the bed plate this pump acts in the opposite sense, and can thus easily cleanse the ascending tube from any foreign bodies which have happened to get in, as they are very apt to do.

M. Perreaux (France—1,142) exhibits valvular pistons in caoutchouc. The piston is in one piece, and hollow below, and terminated in the upper part by two thin lips, generally closed, and so much the more effectually as the pressure above is greater, but which open to leave a passage for the water from below as soon as the pressure on this side predominates. With this piston, and a similar piece forming a bottom valve, a pump is obtained of a very simple construction. It is necessary to remark, however, that the repairs of the pistons in the generality of cases cannot be easy, and that the resistance of the material at the opening, and the small dimensions of the orifices, require an excess of motive power which would become of importance in pumps of any but of small dimensions.

The centrifugal pumps are chiefly represented by the systems of Appold and Gwynne. The first, constructed by Messrs. Easton, Amos, and Sons, obtained a very remarkable success in the first universal Exhibition of 1851. The second, very inferior at that time as regards the successful employment of motive power, has been so well modified, that in the absence of comparative trials, it would be difficult to decide to which of these two machines the preference should be given, for they offer no essential difference except in the position of the axis of the wheel, which is vertical in the first and horizontal in the second. We believe that this system of pumps will receive numerous applications by the ease with which it can be set up, and its working without shock; by the employment of a steam-engine at a high rate of speed, which would be easy of

* The report on the fire-engines is drawn up by the Special Jury on that subject. See Appendix to the Report of Class VIII., page 14.

transport and readily fixed; it is well fitted for employment in large temporary drainage works.

We would mention also for simplicity of arrangement of the different parts, the drainage pump of Mr. Goodwin (United Kingdom—1,862), and the double-acting pump of Mr. Hansbrow, (United States—40), and the double-acting pump of M. Hubert (France—1,200), which furnish the French fountains in the grounds of the Horticultural Society.

Steam Pumps.

Messrs. Harvey and Co. (United Kingdom—1,880), employed in more than half of the waterworks of London, have exhibited a model of one of their large single-acting steam pumps, imitated from the drainage pumps of the Cornish mines. They are now adopted in nearly all large towns. The comparative experiment which will shortly be made at Paris between this system and that of Messrs. Farcot and Son (France—1,152) will therefore be highly interesting. It is useful to remember that in the Cornish engines, even in those used for the drainage of mines, where the mass in movement is more considerable, the action of the steam valve has never been so perfect as desirable. The diameter of the piston has always been too large to allow of the admission of steam at the pressure in the boiler (30 to 45 lbs.) without causing a detrimental velocity; there arises a throttling effect which absorbs a great part of the available work.

A great number of steam feed pumps are to be found at the Exhibition, all with steam and water pistons on the same piston rod, sometimes vertical, but more often horizontal.

Two pumps may be seen from the United States, Mr. H. Steel (39), and Mr. Worthington (28). They are without fly-wheels; one of them has only one steam cylinder and one pump; the slide valve is brought into action instantaneously at each stroke of the piston by means of a small supplementary steam piston very ingeniously disposed. The other pump is composed of two cylinders of each kind; the steam slide valve is guided in each machine by the piston-rod of the other; by this means the movements are simultaneous in opposite directions with perfect regularity.

To mention Giffard's injectors, exhibited by Messrs. Sharp, Stewart, and Co. (United Kingdom—1,299), Flaud (France—1,164), is to record their success. They are found at the Exhibition universally amongst the principal industrial nations, thus showing how this invention has been appreciated.

Professor Colladon (Switzerland—106) is the inventor of a water-wheel to be set in motion by large streams of water, and constructed on the most scientific principles. It is at present used for the raising of water; between two exterior cylindrical surfaces exists a spiral partition in which the water stands at the level of the axis, and can be raised to a height commensurate with the number of the spirals.

Messrs. Wentworth and Jarvis (United States—54) exhibit a windmill for the raising of water; self-regulating when the force of the wind increases; the guide sails close in, and increase the obliquity of the angle formed by the motor-sails, with the direction of the wind.

There has also been placed in Class VIII. a well-arranged machine for washing and bleaching of tissues, exhibited by Messrs. Sulzer Brothers (Switzerland—112), and a machine for washing linen by Mr. Parker (United States—89).

Water Rams.

The different hydraulic rams exhibit no new arrangement, with the exception of that of Messrs. Bollée and Son (France—1,165), by the adoption of a clack valve analogous to double-seated valves. He diminishes considerably the intensity of the shock; the pump feeding the air reservoir set in movement by the play of the ram, but always situated above the level of the highest waters, works even whilst the ram is under water, which allows it to be placed in such a manner as to profit by all the height of the fall. Finally, the valve is counterpoised at will by a regulator, by means of which the velocity of the machine is governed. There is here a manifest progress which should render the use of this machine more frequent.

Hydraulic Presses.

Among the hydraulic presses exhibited there are some in which it has been sought to perfect the movement of the pumps; we may mention that of Messrs. Peel, Williams, and Peel (United Kingdom—1,954), in which the two pumps of different diameters work together. Both work in the usual way up to a pressure determined beforehand; when the effect of the large pump ceases the small pump works alone to the point fixed for the maximum pressure to be obtained, and when its play ceases to have any effect. This modification of the working of pumps is obtained by the very ingenious arrangement of two safety valves acting on the same lever, so that when the pressure reaches the first fixed limit, a valve is raised and gives to the lever a slight movement which causes the water to be driven into the cistern instead of the press; at the second limit another supply valve, raising the former fulcrum of the lever, annihilates in its turn in the same way the action of the small pump. As soon as the pressure descends below the second or the first limit, the small pump, and then the large one, recommence their effective work.

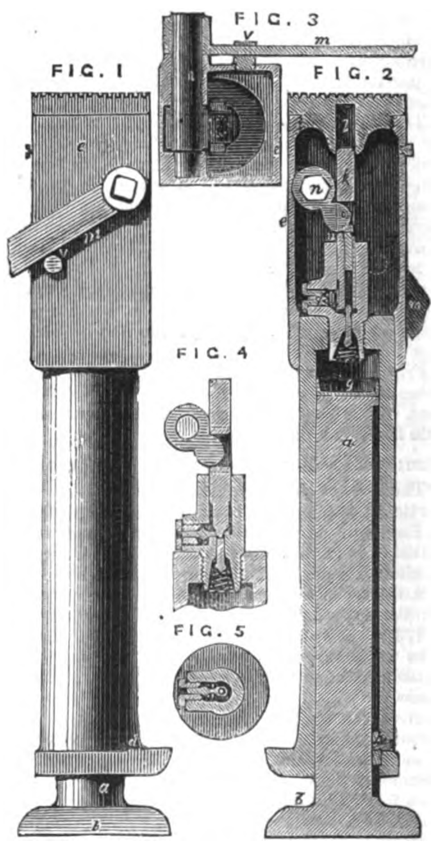
Mr. F. O. Ward (United Kingdom—2,015), has sought simplification of another kind. On a hollow bed, serving also as a cistern, he groups a horizontal steam-engine and pumps, thus compressing two machines into the space of one. The pumps are peculiarly constructed to avoid accumulation of air. They are also of thrice the usual length, and coupled in pairs by a novel arrangement, allowing all four to be driven by two connecting rods—a considerable economy. That their threefold length may not involve diminished directness of thrust, the connecting rods are proportionately lengthened. Thus twelve pumps with their twelve sets of valves are replaced by four, and twelve connecting rods, with their costly fittings, by two. This cheapened construction implies less cost of maintenance, fewer working parts and reciprocating motions, fewer valve beats and less "back slip." The power is transmitted by pinion and spur wheel, geared to afford suitable leverage and suitable relative velocity of the steam and water in motion. These are all points of advantage, but it would seem desirable to isolate the steam cylinder from the cistern, in order to avoid refrigeration.

To be continued.

TANGYE'S HYDRAULIC LIFTING JACKS.

Mr. J. Tangye, of Birmingham, has recently patented an improvement in hydraulic lifting jacks, which consists in constructing and arranging the parts.

Fig. 1 of the above engravings represents in elevation a hydraulic jack, made according to this invention. Fig. 2 represents a vertical section; and Fig. 3 represents a horizontal section of the same. The ram *a* of the jack is solid, and made in one piece with or fixed upon the foot *b*. The cylinder is made of solid steel or other metal, and works upon the said ram *a*, rising and falling thereon. It has a claw *d* at its bottom, whereby lift from the ground can be had when required. On the top of the cylinder the reservoir *e*, containing the water or oil, or other liquid with which the jack is worked, is situated. The pump is situated within the reservoir *e*, and the cylinder, reservoir *e*, and pump therein rise together. A liquid-tight joint is made between the cylinder and ram *a*, by means of the cupped packing *g* on the top of the said ram, as represented in Fig. 2. A slot is cut in the ram *a*, in which slot a key *h* secured to the cylinder by a screw slide, the key prevents the cylinder from turning upon the ram when weight is applied. The pump is screwed into the top of the cylinder as represented; *k* is the plunger of the pump, the upper end of which plunger works in the hole *l*, in the upper end or cover of the reservoir *e*. The plunger is worked by the hand-lever *m* fitted on the end of the shaft or axis *n*. The shaft has a tongue or cam, which works in an opening in the plunger, and by its motion actuates the pump, and thereby raises or lowers the plunger. The liquid from the reservoir *e* is conveyed to the cylinder so as to raise the jack, and returned from the cylinder to the reservoir so as to lower the jack in the following manner:—The inlet valve *q* of the pump is fitted on a small brass seat, and the valve case containing the valve is screwed into the side of the pump near the bottom of the cylinder. The valve *q* is kept to its seat by a helical spring. The valve *s* is situated in the axis of the pump, and in a line with the plunger *k*, this valve being kept to its seat by another helical spring. By working the hand-lever *m*, the plunger is raised and lowered in the pump through the cam or tongue and shaft, and the liquid from the reservoir *e* is forced into the cylinder, and the cylinder and parts carried by it raised. On the side of the reservoir a pin *v* is situated, the object of the pin being to limit the descent of the hand-lever *m* during the raising of the jack. The liquid in



the cylinder is returned to the reservoir when the jack is required to be lowered, by means of the lowering valve *u*. The lowering valve is situated and works in the hollow of the plunger *k*, and is kept to its seat by the downward pressure of the tongue or cam, the edge of the tongue or cam pressing on the top of the said valve so long as the hand-lever *m* is not depressed below the pin *v*. When, however, it is required to lower the jack, the hand-lever *m* is shifted on the shaft or axis *n*, so as to clear on its descent the pin or stop *v*, and be enabled to take the position represented in Fig. 2. When the lever *m* is brought into the last described position, the edge of the cam or tongue no longer presses upon the valve *u*, and that valve is raised from its seat by the pressure underneath it, and forced into a slot formed in the end of the cam. At the same time the lower end of the plunger *k* forces the outlet valve *s* from off its seat, and the liquid from the cylinder passes through the valves *s* and *u* to the reservoir *e*, and thereby lowers the jack.

Fig. 4 represents in vertical section another

arrangement for opening the valves so as to lower the jack; and Fig. 5 is a horizontal section of the same. In this arrangement a third or lowering valve, as described and represented in Fig. 2, is dispensed with. The inlet and outlet valves are arranged similarly to those before described; but one of the valves has an elongated stem or head, with a hole in the centre thereof. The bottom end of the plunger is contracted as represented. On depressing the handlever *m* below the stop pin *v*, as before explained, in order to lower the jack, the contracted end of the plunger passes through the hole in the head of the valve, and withdraws it, and at the same time strikes against the other valve, and forces it from its seat. The water ways of the valves are thereby opened, and the liquid from the cylinder returns through the said waterways to the reservoir, and thus lowers the jack.

KING AND VARVILL'S FLUSHING APPARATUS.

Messrs. King and Varvill, of Liverpool, have recently patented an invention for an apparatus for flushing closets, as illustrated in the above engravings, which they describe as follows:—

This invention relates to the apparatus immediately in connection with the cistern obtaining the flushing fluids, and though applicable to all cisterns, is especially so in large towns where a

FIG. 2.

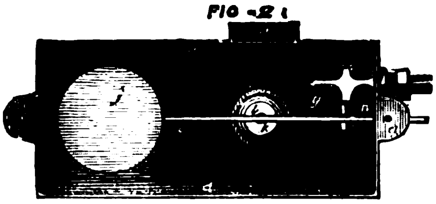
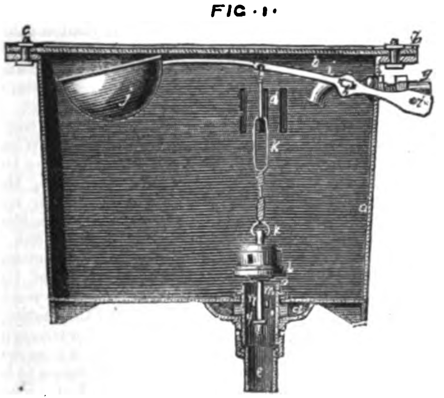


FIG. 1.



small or intermediate cistern is supplied from the street mains, or from a cistern at an elevation, the object being to prevent the waste of the flushing fluids.

To the ordinary connections of the hand lift or pressure seat arrangements, we joint or otherwise connect a lever, which is carried into the cistern, and balanced or supported on the end of the horizontal plug or barrel of a tap fitted to the supply pipe. On the other end of this lever is affixed the float, and between the said tap and float is attached a chain or lever which reaches to, or near to, the bottom of the cistern, and operates the out-flow or flushing valve. The overflow pipe is cast with the cistern and communicates with the flushing or waste pipe in the usual way.

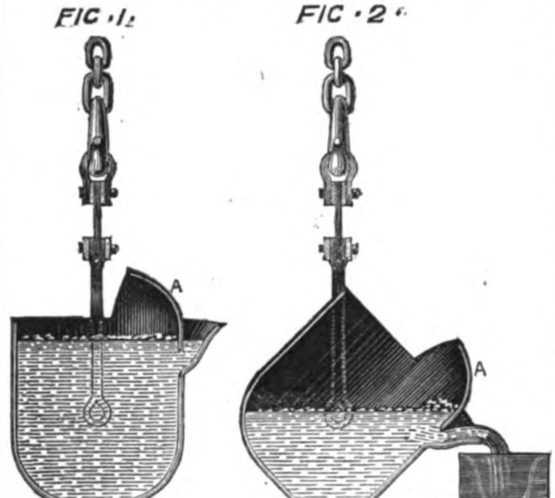
By this arrangement it will be seen that when the part of the lever outside the cistern is acted on, the float will be raised, the supply tap shut, and the out-flow or flushing valve opened; but as soon as the lift or pressure seat is left at freedom the float falls and opens the supply tap, until such time as the cistern is again filled; thus preventing more than the quantity contained in the cistern from being used by one movement.

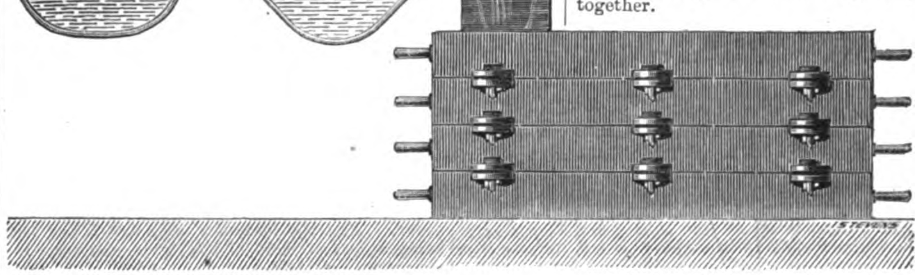
Fig. 1 is a section of one of our improved apparatus with, or as part of, a small or intermediate cistern; and Fig. 2 is a plain view of the same apparatus with the cover or lid removed. *A* represents the cistern, which may be conveniently placed on a shelf or in a recess in the wall of a house or other building, the opening or mouth being closed or covered by a lid *b* fastened by bolts and nuts *c*; *d* the water or flushing fluid overflow passage, it may be cast, or otherwise formed as part of the cistern, the lower end of which said passage or way communicates with the out-flow or flushing pipe *e* by the opening *f*; *g* the water or fluid supply tap, the pipe connection for which may be led directly from the street mains or from another cistern at a greater elevation; *h* the plug of the tap to which the combined float and operating lever *i* is attached. At or near to one end of this lever there is an aperture or other means of connection, to which the hand lift pull, or other arrangement of closet apparatus, is made fast, and if the coupling or jointing gear consist of another lever, say in the usual vertical position, then it must have a slot or its equivalent therein, to allow the lever *i* to be operated by the float for filling the cistern; we prefer, however, to make the connection by a chain or rope. At or near the other end of the lever is the float *j*; *k* is a wire chain attached to the lever *i*, and to the out-flow valve *l*, which latter has a guide *m* passing through the straps *n* to bring the said valve properly to its seating *o*. The lever *i* is depressed at the outer end, consequently the float *j*, the wire chain *k*, and valve *l*, are raised into position to allow the water or other flushing fluid to escape by the pipe *e* to the closet. When the chain is released, the float *j* will descend by its own weight, open the supply tap, and admit water or other fluid to the cistern for the next flushing. The opening in the plug of the tap when one of the ordinary construction is used, or the passage in the tap of whatever kind employed, must be so arrangedthat when the lever is acted on sufficiently to open the valve *l*, the supply must be shut off, otherwise the great economy of flushing fluid effected by our apparatus would be frustrated, for the lever *i* might be moved, the valve *l* opened, and the flushing fluid might flow from the supply tap *g* through the cistern *a* by the pipe *e* in a continuous stream. As before stated, the only quantity of flushing fluid that can be obtained by one movement of the pull or other arrangement is that contained in the cistern.

The Duke of Luynes has just transferred to the French State, by deed of gift, his magnificent collection of antiques, marbles, bronzes, and medals, which he has passed his life in putting together.

AN IMPROVED FOUNDRY LADLE.

FIG. 1. FIG. 2.





The engravings show an improved foundry ladle, lately invented by Mr. John Phillips, the foreman of the iron foundry at Messrs. Maudslay, Sons, and Field, and which has been tried in their foundry with great success. The object of the improvement is to prevent the necessity of skimming the metal by hand when pouring it, as is now usually done. This is accomplished by fixing a curtain plate at the mouth of the ladle, which projects downwards into it so as at all times to be below the surface of the metal when in the act of pouring. This plate effectually skims the metal, and allows only a stream of pure metal from below to run into the mould. Fig 1 shows a ladle fitted with the curtain plate A, and fig. 2 shows the same when pouring the metal.

Another experiment was tried in the same establishment with a ladle with a central hole through the bottom fitted with a plug, as practised by Mr. Bessemer in running his converted metal into the moulds. This experiment was also successful, and the plan will be of great service in running large castings, as it effectually prevents any of the scoria from getting into the mould, and also saves the labour and the risk of turning up the large ladles, as hitherto practised.

Scientific Jottings.—M. Em. Monnier recommends the following method for dyeing wood of a rose colour by chemical precipitation:—A bath A is prepared with 80 grammes of iodide of potassium per litre of water, and a bath B in another vessel with 25 grammes of bi-chloride of mercury. The wood to be dyed is first put into the bath A, where it is left for several hours; it is then dipped into the bath B, when it assumes a beautiful rose colour. The wood thus dyed is afterwards varnished; the baths will last a long while without any necessity for renewal. M. Payen recommends the following cure for diseased trees and shrubs:—As soon as it is perceived that the leaves are turning yellow the earth must be dug up all round the root within the space of a metre and a half from the stem, and the roots are then watered, twice on the first and once on the following day, with a solution of 525 grammes of sulphate of iron, 500 of common salt, and 525 of alum, in 40 litres of water. This treatment will instil fresh vigour into the sound roots, corrode the bad ones, and restore the health to those which were about to be attacked. The amalgam of sodium as an agent for reducing metals is beginning to attract attention. Mr. Ch. W. Vincent has obtained an amalgam of chromium by introducing that of sodium into a solution of chloride of chromium, and by subsequent distillation in a retort filled with naptha vapour the chrominm itself is obtained in a finely divided state. Mr. W. B. Giles also has decomposed a saturated solution of pure protochloride of manganese by the amalgam of sodium, whereby an amalgam of manganese was obtained. The mercury of the latter being driven off by the application of heat, there remains a brownish black powder, which appears to be manganese.

DEFLECTING ARMOUR FOR SHIPS.

FIG. 1.

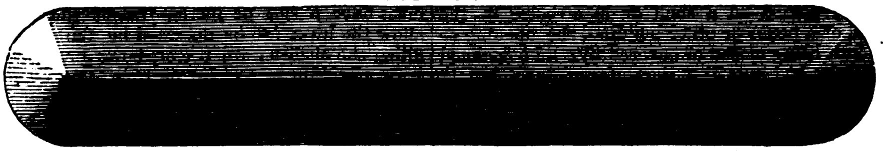


FIG. 2.

FIG. 3.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—In a recent number of your valuable magazine, I read with much interest a description of deflective armour for ships of war proposed by Mr. Richardson. As far as its deflective powers are concerned, it might, no doubt, answer its intended purpose, but as to the construction of his shields he appears to have fallen into a great error.

I will call your attention to those parts in it which seem so defective, and for the sake of better illustrating my meaning, I refer to the drawing you gave. Mr. Richardson there points out the action of shot when striking upon these conical shields, but only in two different points, and these two on the surface of the shield; everyone will of course admit that the shot would be deflected from these two points; but a shot coming full force from a gun's mouth is not confined to these two particular points; it is quite as likely to strike it in a much more dangerous part than this, and I would ask Mr. R. what would be the consequence if it struck it in that part where the three conical shields meet (as seen in fig. 1 of his drawing)? Would it be deflected then? I trow not! but severe results, it is to be feared, would follow, and worse still, such as could not be easily repaired, for I believe that such a structure, made as strong as modern science will permit of, must inevitably yield when submitted to the action of such ordnance as we are now able to produce.

There is no doubt but that a system of deflective armour might answer very well if the world were confined to the use of spherical or elongated projectiles with round heads; these would naturally glance off; but, I ask, would a punch or square-headed shot do so? Would not its sharp edge tell uncomfortably upon the conical shield? For let it be struck at whatever angle it is possible to do from an opposing ship, by a shot such as the last mentioned, it must to some extent be injured, especially if it be not very thick; and from recent experiments there is every reason to believe that such projectiles will come into use. These last remarks seem to be the great objection to deflective armour.

For my own part I cannot see why Mr. R. proposes a series of these conical shields, for in such a structure there are so many places where a shot striking must naturally commit serious destruction—I mean at the junction of these cones or shields.

Undoubtedly a great amount of good might be obtained from using armour that would deflect shot, but it must be constructed differently to the one proposed, and in a form that would answer the purpose better. I refer to the diagrams hereunto annexed, of which fig. 1 is a front elevation, fig. 2 a plan, and fig. 3 an end view, of a shield for deflecting shot, proposed to be attached to the sides of a vessel of iron; the shield is intended to extend the whole length of the unprotected portion of the ship, and to any extent that experience will prove best below the water line.

On referring to the diagrams it will be seen that the shield has the same sectional form as Mr. Richardson's, but differing in this respect, that the same form is continued in one continuous length along the ship's side, possessing the advantages of uniform strength and shape, not having any point in it where, being struck, it is more likely to yield than at any other; a shot striking at any point on this shield would be deflected; but as I have before said, those square or punch-headed shot must punish it severely, of whatever form it may be. Here lies the difficulty of rendering ships' armour unyielding to such terrible opponents. In submitting this form I do not suggest any mode of fastening such a shield, but the shape of it only. I trust that Mr. Richardson will not accuse me of having picked his invention in too many pieces, but as he very truly remarks in the early part of his letter, "that he considered the duty of every artillery engineer officer to produce guns that will be able to crush these plates," so I considered it my duty to point out what appeared defective in his armour, trusting it may tend to elicit some truth on the subject, and that you will kindly allow space for these remarks in your columns.

I am, Sir, yours very faithfully,
ST. JOHN VINCENT DAY.

Newton Abbot, 1st October, 1862.

THE WAVE LINE THEORY.

SIR,—Mr. Quart asks you for a short space to "contradict" my statement regarding the yacht "America's" load line. He then quotes that statement, but does *not* contradict it. Rather strange this. Mr. Quart appears to deem it preposterous in me to suppose that the wave line is applied by its advocates as the plane of flotation. In yachts, be it observed, this plane may be considered constant, with regard to its distance from the lower part of the keel. He says, "Just as if the load water line is to be a wave line." Well, is it not a *sine qua non* with wave line theorists that this should be so? I think it is. Mr. Quart must enquire as to this. But what does he mean by saying, "perhaps, Nauticus would like the deck line to be a wave line?" Now, seeing that I have argued for concave lines about and at a moderate distance above the gripe, for convex lines about the surface of the water, and for buoyancy above, I can only characterize this remark of Mr. Quart as foolish, if not worse. The "bow and stem of the 'America' are both perfect wave bodies." Such is the *ipse dixit* of my censor. But we are discussing the wave *line* theory, not the wave *body* theory. And the idea of a stem and a bow both being a perfect body of the same character! I cannot understand it.

Mr. Quart proceeds, "if Nauticus will try about 6 ft. below the load line, he will find as beautiful a wave of translation and a wave of oscillation as possibly can be constructed." Now these two great pearls are worth diving for. Let us try.

I take the drawing of the "America" and observe, as is well known, that her keel is curvilinear, rounding up considerably forward. At 6 ft. aft from the front of the stem, at the load line, occurs my first vertical sectional line; at that line the rabbet of the keel is only 3 ft. 2 in. under water. At 5 ft. further aft it is about 4 ft. 8 in. under water. At 5 ft. still further aft it is about 5 ft. 6 in. under water, and at 5 ft. further aft still the rabbet of the keel is 6 ft. under water. Now, having gone 21 ft. aft in a vessel about 90 ft. long without finding any portion of the vessel's body so deep as 6 ft., I must give up as hopeless the two treasures which Mr. Quart has held out to delude me.

Mr. Quart's last sentence is, "Nauticus would alter his opinion about Mr. Scott Russell's wave line if he only knew how to apply it." For this read, "if he only knew how to apply it *with advantage*," and I at once shake hands with Mr. Quart.

NAUTICUS.

[We have received several other letters on the wave line controversy, including a long one from Mr. Moy, but we think our readers will agree with us in thinking that enough has been said, for the time, on the subject. We beg, however, to thank our numerous correspondents for their interesting and instructive letters.—ED. M.M.]

NEW JETTY, DEVONPORT DOCKYARD.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—In your paper of the 3rd October you are pleased to speak favourably of this important work. I am gratified it meets with your approval; but there is one error in your notice which I should desire to correct. You say it was designed by me; this is not so. With the merits of the design, which I think very good, I have nothing to do. This credit belongs to the Director of Works Department, at Somerset House. I have only endeavoured to give effect to his design, by executing the works for the Board of Admiralty in the best possible manner, and if the quality of my work be approved of I am satisfied,

I am, Sir,
Yours most respectfully,
HENRY GRISSELL.

Meetings for the Week.

Civil and Mechanical Engineers' Society.—On Setting out Railway Works, by G. J. C. Dawson, at 7·30 p.m.

Gossip.

At present the iron-shipbuilding works of Messrs. Laird, Brothers, and Co., at Birkenhead, present a very animated spectacle, upwards of 3,500 men being employed there on various vessels, amongst them the monster iron-clad frigate "Agincourt," 6250 tons, for the royal navy—the construction of the ship herself, the new dock in which she is being built, and the shed which covers it, all proceeding simultaneously; the screw troopship "Orontes," a noble-looking craft, of 3,008 tons, also for the royal navy, and intended to be launched about the end of November; two iron-clad shell-proof rams, of very peculiar shape and construction, rising into shape under the shed where the famous "290" was put together, and the paddle steamer "St. Columba," built some years ago as a Holyhead express boat, and now lengthened 40 feet and converted into a boat for carrying cattle for the City of Dublin Steam-packet Company.

RANSOMES AND SIMS' CROSSING.—In a letter addressed to one of our contemporaries, allusion is made to Ransome's and Sims' patent chilled cast-iron crossings; and the assertion is made that similar crossings have been in use on the Stockton and Darlington railway for above 25 years. It appears, however, to be a misapprehension on the part of the writer to suppose that Ransomes and Sims claim a chilled cast-iron crossing as new. What they seem to claim is the mode of manufacture. On reference to the patent, No. 853, year 1856, the claim will be seen to be as follows:—"I do not claim generally the making of railway crossings, either in part or entirely, of cast-iron; but what I claim as my invention is the making of railway crossings, when of cast-iron, with those portions of the wing rails which are subject to the greatest wear, of harder cast-iron than the other part of the casting, and using in combination therewith a steel or wrought iron point, so connected as to be capable of removal and renewal." Whenever invented, this seems to be a very excellent and durable crossing, and any iron-founder will know that it must be very cheap to manufacture. There are three different exhibitors of these crossings in the western annexe of the International Exhibition; one being the firm of Ransomes and Sims; the second Herr Ganz, of Buda, Austria; the third being the Maschinenbau-action, Gesellschaft, of Cologne, in the Zollverein division. The latter firm shows some broken pieces of this kind of crossing in a glass case, in order to make us English fully understand the advantages of chilling the wearing part of a casting! It is possible that the Prussians of Cologne believe themselves to be the original inventors of this as of most other things. It is well known that they refused Monsieur Gifford a patent for his injector, on account of want of novelty. They showed, however, some appreciation of it, as soon afterwards a law was made forbidding any boiler in the Prussian dominions to be without it. Their brasswork manufacturers offer to put the injector on to English portable engines to be imported into Prussia. They give us a reason for accepting the offer—that they can do it cheaply, having no royalty to pay!

A correspondent in a letter on railway accidents, says:—"The question is, can anything be done to prevent or diminish such accidents? I answer unhesitatingly, yes; and the way, and the only true way, is the most thorough and perfect system of brakes, which should be in the control of the engine-driver or guard throughout the entire train

No vehicle should run in a passenger train, nor should any carriage be considered complete without a perfect brake of power enough to stop the wheels. The momentum of a train at forty or fifty miles per hour is something enormous; it exists at every point of the train, and can only be arrested promptly by brakes. This power may not be, and perhaps is not, needed for the ordinary purposes of traffic, but still no train should run without this safe-guard. Anchors, extra spars, lifeboats, pumps, life-preservers, &c., &c., are not needed for the ordinary purposes of a ship, but no passenger ship is considered complete without these precautions. Hundreds of inventions have been made for this purpose, demonstrating that trains can be stopped in a fourth the distance that they usually are. Why, then, are they not adopted? Is it on account of the cost? Surely that should not be an objection. Suppose it should cost £20,000 for any of our leading companies to arrange its entire stock with such a precaution, that would be £4,000 a-year for five years, and it is not possible for the same amount of money to produce such an amount of safety in any other way. It could run its trains every three minutes, without a signal on its line, with more safety than they now can with the best of signals."

The annual meeting of the Association of Assistant-Engineers took place at Glasgow on Tuesday night, in the Religious Institution rooms, when the report of last session was read by the secretary and adopted. The meeting then proceeded to the election of office-bearers, when Mr. W. R. Copland was re-elected president, and Mr. William Foulis, 3, Holmhead-street, secretary. A paper was announced for next meeting, "On the Slide Valve," by Mr. W. Foulis.

A locomotive mail-clad battery has been constructed at Jackson, Tennesse. It is constructed upon a platform car thirty feet long by eight wide. The sides and ends are of 2½-inch oak plank, upon which boiler iron is riveted. The sides lean inward sufficient to glance a ball upward; one end is perpendicular, and the other pitched to a sharp angle. In the centre of the car is the circle upon which the gun-carriage revolves, and the whole arrangements of the gun are designed with reference to counteracting the recoil at the firing. A 6-inch James rifle cannon is mounted so as to sweep in every direction, and it has been tested with shell. It is designed to protect trains against guerrillas.

THE ORIGIN OF PETROLEUM.—The Canadian *Journal of Art* asserts that Canadian petroleum is not derived from coal, nor is it of recent origin. It says:—"Petroleum was formed long before the coal, and is the result of the decomposition, under pressure, of an infinite number of oil-yielding animals which swarmed in the seas of the Devonian period, long anterior to the coal. The decomposition of marine plants may have given some oil to the rocks of Canada and the United States, which are saturated with this curious substance. The shale beds of Collingwood furnish an answer to those who object to the infinite number of animals it would require to produce the oil locked up in the earth. Those shale beds are composed altogether of the remains of Trilobites—they extend from Lake Huron to Lake Ontario, and far west and east of these lakes. The oil-bearing rocks of Canada were once a vast coral reef, extending from the Gulf of Mexico to Lake Superior. There is the best ground for belief that the supply of oil will last for a long period, and that new discoveries will be made in different localities."

The death of Mr. James Walker, C.E., took place on the 8th inst., at Great George-st., Westminster. The lamented gentleman was in his 81st year, and although his demise occurred somewhat suddenly, it cannot be said that it was premature. Mr. Walker had enjoyed an exceedingly prosperious professional career, and his name is indissolubly connected with very many great civil-engineering works in all parts of the world. No doubt the most prominent of these will be referred to in the biographical sketch of Mr. Walker which will be read at an early meeting of the Institution of Civil Engineers, of which eminent body he was elected president on several occasions. Mr. Walker's history affords another illustration of the sure success which waits on perseverance and energy; for he originally came to London in the capacity of a journeyman millwright, and he, probably, dies a millionaire.

"A gentleman," says the *Scientific American*, "who has spent some days in the region of the coal oil wells, in Pennsylvania, says that in his opinion the Government of the United States ought to interfere at once, and put a stop to further pumping and boring for oil on this continent. He is quite certain the oil is being drawn through these wells from the bearings of the earth's axis, and that the earth will cease to turn when the lubrication ceases! Such a suspension would beat anything that ever agitated Wall-street, and the consequences be too great for ordinary minds to conceive or comprehend. It should be attended to at once."

ALLOYS OF ALUMINIUM.—Two alloys of this metal have been manufactured at Newcastle, viz., copper 95, aluminium 5; and copper 92½ to 7½ of aluminium, and called by those working them aluminium bronze. We have examined both proportions, and give preference to the 7½ per cent., especially for colour. The hardness appears quite equal to the best brass, while the colour is that of rich gold; it takes a high polish, and appears to work soundly. We recommend experiments with this latter, namely, 7½ aluminium bronze, to our readers, and suggest that particular attention be paid to the effect of atmospheric moisture with varying temperatures, as it is represented not to tarnish. If such be the case, its employment for the frames of watches and chronometers might save much labour and expense.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the Proprietors of this Magazine. Other Papers are hereby warned not to produce them without an acknowledgement:—

STEAM ENGINES, 769, 776, 788, 819, 833.
BOILERS AND FURNACES, 786, 814, 831.
ROADS AND VEHICLES, 784, 799, 809, 839.
SHIPS AND BOATS, 762, 770, 774, 820.
CULTIVATION OF THE SOIL, 773, 836.
FOOD AND BEVERAGES, 760, 802, 813, 822.
FIBROUS FABRICS, 790, 791, 793, 797, 816, 817, 818, 842.
BUILDINGS AND BUILDING MATERIALS, 777, 796, 834.
LIGHTING, HEATING, AND VENTILATION, 778, 785, 795, 800, 803, 807, 811, 824, 826, 838.
FURNITURE AND APPAREL, 761, 763, 764, 772, 775, 781, 792, 798, 808, 810, 823, 832, 835, 844.
METALS, 805, 806, 815, 825, 829.
CHEMISTRY AND PHOTOGRAPHY—*none.*
ELECTRICAL APPARATUS, 843.
WARFARE, 789, 821, 827, 840, 841.
LETTER-PRESS PRINTING, 767, 781, 783, 845.
MISCELLANEOUS, 765, 766, 768, 779, 780, 782, 787, 794, 801, 804, 812, 828, 830, 837.

760. R. A. BROOMAN. *Improvements in the manufacture of barytes and barytic products, and the application of these substances in the manufacture of sugar and other uses.* (A communication.) Dated March 18, 1862.

In carrying out this invention the inventor takes carbonate of barytes and treats it according to the processes known as those of Messrs. Dubrunfaut and Leplay, that is to say, he pulverizes carbonate of barytes, mixes it with powdered coal, and calcines it in a reverberatory furnace. After having been subjected to heat for from about five to six hours, a product is obtained composed of caustic barytes, coal, and ash, known as raw barytes. This composition is cooled out of contact with the air; it is afterwards lixiviated, and a solution of barytes is obtained adapted to effect the precipitation of sugar. The caustic solutions are first desulphurized by hydrated oxide of iron, or by hydrated oxide of zinc; they are then concentrated in iron vessels, heated by the gases from the reverberatory furnaces, or otherwise. When the solutions have acquired the greatest density of which they are capable without forming a deposit, they are removed to iron vessels similar to those used in the manufacture of caustic potash and soda. The caustic barytes is reduced in these vessels to the state of dissolved hydrate with one equivalent of water; it is next run into iron pots in blocks easy to carry. The inventor states that this economical method of preparing barytes will enable it to be sold at so low a price that its use will spread for many purposes. The hydrate may be used in sugar refineries for precipitating the treacle, and the carbonates may be returned by the refiners to the manufacturers to reduce. The processes above described for natural carbonate of barytes apply to artificial carbonates of barytes, and the hydrates of barytes may be manufactured by means of sulphate. For that purpose he reduces in a furnace sulphate of barytes mixed with coal, exactly as above stated for the treatment of the carbonate of barytes. He thus obtains raw sulphuret, which, by washing, yields solutions of sulphuret of barium. These solutions, treated by a current of carbonic acid, yield carbonate of barytes, which is transformed into hydrate by the processes above described. Sulphuret of barium may be used in excess to precipitate sugar; then the sugar of barytes and the mother waters treated by carbonic acid will yield carbonate of barytes, which may be treated according to the processes hereinbefore described to obtain the hydrate. *Patent completed.*

761. J. T. BUCK. *Improvements in instruments and work cases known as "Ladies' Companions."* Dated March 18, 1862.

In constructing and fitting up these cases the inventor takes a wedge-shaped case, similar to those now used as scissor cases, and fits therein compartments for containing, behind each other, pairs of scissors, of different sizes. He then inserts a wedge-shaped slide behind the scissor compartment for carrying a knife, eyelet piercer, nail trimmer, or other articles, according to taste. This slide may carry articles both at front and at back, or at front only, and a looking-glass may be attached to the back; or the looking-glass may be made to form a separate slide by itself. At the back, again, of the before-named articles he inserts a wedge-shaped folded thread and needle carrier, and on the inside of the flap which folds over to close the case he attaches a thimble carrier, pin-cushion, and needle cases. *Patent abandoned.*

762. A. KRUPP. *Certain improvements in the method of manufacturing shafts for steamboats and other purposes.* Dated March 19, 1862.

This invention has relation to the construction of shafts for steamboats and other purposes, whereby the inventor is enabled to form large shafts of two or more parts, coupling the same together, as follows:—He forms on the end or ends of each portion of the shaft a flange, in the centre of which, and corresponding with the centre of the shaft, is a projection or a hollow, as the case may be, the projection in one end of the shaft fitting into the hollow in the end of the contiguous portion of the shaft. The two flanges on the two ends of two portions of the shaft, when brought together, should exactly fit, and there is formed round the circumference of the flanges (one half being in each) a rib. The flanges are bolted together with strong bolts and nuts, or rivets. He cuts into the flanges two, three, or more key-ways, radiating towards the centre of the shaft, and fits into these key-ways correspondingly-shaped keys. The key-ways should be so cut as that half the thickness should be in each flange. When these keys are inserted he takes a hoop of the same width as the two flanges when combined. This hoop is divided into two or more parts, and placed round the circumference of the flanges, the inside of the hoop having a groove or recess corresponding with the rib on the circumference of the flanges. This hoop may be in one piece, if thought desirable, in which case the hoop must be expanded by heat till sufficient to pass over the rib on the flanges. He then shrinks on the outside of this hoop a steel or iron ring, which tends to bind the whole more securely together. By this arrangement he is enabled to form crank shafts in two or more pieces, coupled together, having two or more cranks, and of larger dimensions than can conveniently or economically be forged in one piece. *Patent abandoned.*

763. R. HADFIELD and J. SHIPMAN. *Improvements in hardening and tempering wire and crinoline steel.* Dated March 19, 1862.

This furnace is constructed with fire-clay tiles or slabs, or metallic slabs having holes or longitudinal channels, through which the wire steel is drawn. These slabs, made of such sizes, and with as many holes or channels as may be required, form the covering of the firing places; the heat passes from beneath them through apertures in each angle of the furnace, along the top surface to the central outlet flue, through which its passage is regulated by a damper in the usual manner. In close proximity to the outlet end of the furnace is placed an open cold water trough, partially immersed in a vessel containing a hardening composition of tallow, resin, and whale, or other suitable oil, mixed in the proportion of about one pound of tallow and one pound of resin to one gallon of oil. The vessel containing the hardening composition is immersed wholly in another vessel, into which water from each end of the open trough is continually flowing, the waste water passing off through outlets in the angles. The steel is drawn beneath the cold water trough through the hardening fluid, and thence through clips between leather or other material, to remove partially the oil, &c., adhering to it. Being thus hardened, it is tempered by being drawn beneath a roller through molten lead, heated to a proper temperature, in an open vessel. The rolls which regulate the motion of the steel, and draw it through the furnace and troughs, are adapted for drawing as many strings or strips of steel, or wire, as may be required, of different widths, thicknesses, or gauges. The lower roll is in one length, but for each string there is an independent upper roll, which can be adjusted by springs and screws to the size of the steel passing beneath it. Before being wound on the swift or reel, which receives the steel on completion of the process of hardening and tempering, a considerable length is exposed to the action of the atmosphere, in order that the necessary cooling and consequent contraction of each string may take place. *Patent completed.*

764. S. DESBOROUGH. *Improvements in the manufacture or construction of sewing or other needles.* Dated March 19, 1862.

The needles manufactured according to this invention are formed by preference with an additional eye or eyes near the head of the needle, through which the sewing thread is passed, after passing through the ordinary eye of the needle, by which arrangement the thread will be prevented from drawing out so readily as is the case with needles of the ordinary construction. *Patent abandoned.*

765. R. WILSON. *Improvements in hydraulic presses, and in machinery or apparatus for raising or forcing fluids.* Dated March 19, 1862.

This invention consists in applying three or more cylinders and rams to the same hydraulic press, whereby the pressure can be regulated according to the resistance to be overcome. *Patent completed.*

766. S. Moore. *Certain improvements in machinery for compressing and cutting tobacco.* Dated March 19, 1862.

These improvements are applicable to those machines in which the tobacco is continuously supplied, compressed, and cut, and they consist in giving the requisite intermittent advancing motion to the cutting or "play boards" by a screw, the cutting boards being formed in detachable parts, each of which is carried forward towards the cutting knife by means of a driver, furnished with one or more parts of nuts gearing into the screw. The cutting boards bear upon, and are firmly supported by, a fixed or adjustable iron bed, furnished with grooves by which the drivers are guided. *Patent completed.*

767. R. A. Brooman. *Improvements in printing and painting upon glass and ceramic wares, and upon metallic and mineral substances; also in the preparation of inks and colours for printing and painting.* (A communication.) Dated March 19, 1862.

This invention consists in methods of printing or painting upon glass, ceramic ware, stone, metal, and other surfaces, directly, or indirectly, by means of what the inventor terms reserves, as well as in the preparation and use of colouring matters and inks suitable for this particular class of printing, and for other purposes. First,—Impression upon glass or ceramic ware: This part of the invention comprises four processes:—1. Impression by transfer of reserves soluble in liquids or destructible by fire, and figuring in relief upon the glass the lines and outlines of the design transferred. A design being given, previously engraved upon wood, stone, or metal, it is printed upon paper in fatty ink, according to the means now followed for such purpose. This design is transferred to glass, and constitutes the reverse; then by a pencil or brush the inventor applies the metallic silicates or oxides, which, after firing, are to show the impression. In order that these oxides, silicates, or metallic colours, may adhere to the glass, and at the same time be insoluble in solvents of resinous and fatty bodies, which compose the fatty inks, the oxides, colours, or silicates, are mixed up with a solution of gum, dextrine, or other similar organic substance impressible and capable of adhering to glass, and are desiccated; the fatty reserve is next dissolved, either in sulphuret of carbon or in hydrocarbons, or other similar solvents which will not have the effect of dissolving gum, dextrine, or other analogous organic substances. The vitrifiable oxides and metallic colours held upon the glass by bodies insoluble in liquids in which the fatty reserves become dissolved, remain fixed upon the glass, and are subjected in muffles to the fire; they vitrify and form the lines and outlines of the design to be reproduced.—2. This second process, which is the counterpart of the first, differs only that the printing of the reserve is effected in thin inks; the vitrifiable oxides or metallic colours are fixed and applied in the hollows and interstices of the reserve with fatty or resinous bodies insoluble in water, whence it follows that, the reserve being soluble in water, he attains, by simply reversing the substances employed, a similar end to that arrived at by the process first described.—3. The third process consists in taking a design previously engraved on stone, wood, or metal, in printing it upon paper in a fatty ink containing combined with it oxides, carbonates, alumino-silicates, or alkalino-terrous sulphates, earthy or metallic, and little or not at all vitrifiable at the temperature at which glass fuses. The design printed upon paper in the said ink is transferred to glass, and forms the reserve; in the hollows and interstices of this reserve he applies, either in a damp or in a dry state, vitrifiable metallic oxides or colours, which are intended to reproduce the design printed. Firing then takes place, the articles are allowed to cool, after which, the non-vitrifiable bodies which have acted as the reserve are removed with a brush, by hand, or by acids.—4. The fourth process is the counterpart of the third in that the reserve is printed in thin ink instead of in a fatty ink. The invention also comprises processes for the preparation of the inks and colours employed. *Patent completed.*

768. R. A. Brooman. *Improvements in reproducing or in producing copies of guipure laces, embroidery, and other like articles.* (A communication.) Dared March 19, 1862.

This invention consists in means (which cannot be described here in detail) of producing, without the aid of engraver or draughtsman, stereo-plates of all designs or patterns, which possess or are capable of offering a relief, such as guipure, embroidery, lace, and the like. The process followed consists, in principle, in making the object to be reproduced serve itself for its own re-production. *Patent completed.*

769. R. A. Brooman. *Improvements in rotary engines.* (A communication.) Dated March 19, 1862.

This invention consists in a movable piston sliding in a mortised shaft, tangent to the interior surface of an ellipsoidal cylinder, which piston is in constant contact at its ends with the inner surface of the said cylinder. Metal packings, kept up by springs, are fitted to the ends and sides of the piston, as also to that part of the shaft through which the piston slides. At the sides where the shaft enters and leaves the cylinder it is made conical, and a correspondingly-shaped collar is pressed into contact therewith by springs in order to ensure a steam-tight joint. By reversing the inlet and the outlet the shaft can be made to revolve in either direction. A lubricating passage at the top of the cylinder, fitted with taps, admits lubricating matter into the cylinder, and passages are also provided for lubricating the conical parts of the shaft. The engine is worked by steam, air, or any other gas. *Patent completed.*

770. R. A. Brooman. *Improvements in apparatuses for drawing in and paying out chain cables, applicable to windlasses and capstans.* (A communication.) Dated March 19, 1862.

In carrying out this invention, catches, free to rise and fall in guides, under the action of levers, are placed round the internal circumference of the frame of the apparatus, the number of catches being regulated according to the size of the apparatus or the size of the chain to be worked. These levers are mounted on the same axis as longer levers, which extend outside the apparatus and terminate in rings. When heaving in, handspikes are inserted in the rings; and as the apparatus is thereby caused to revolve, the catches become raised as they approach the chain and act upon it. *Patent completed.*

771. J. Cumming. *Improvements in the method of and apparatus for distributing and setting-up type.* Dated March 19, 1862.

This relates, 1st, to a novel method of distributing type that has been used for printing, and for arranging the letters or type in order in columns suitable for being placed in the composing machine, which forms the second part of this invention. The distribution or arranging of the type in columns is accomplished in the following manner:—Marks or nicks are cast out or planed by preference on the back of the types, but these nicks may be made in any convenient part of the type. By making these nicks long or short, and arranging them at different parts of the type, as great a number of combinations may be produced as will be required for different letters. A sharp edged rule is made to pass the whole length of a line of types, and this edge is inserted into these nicks. Another similar rule is applied in the same way at the same part of the type, or in another nick, and by causing these rules to approach or recede from one another, the type will be separated into the different characters. A nick is left at each end of the types for the purpose of drawing the letters from one another by force, after they have been partially separated. By means of this composing machine, which forms the 2nd part of the invention, the types are set up and formed into words or sentences by selecting or taking single letters. This selecting is effected by keys arranged on a kind of scale-board, and by depressing these keys the letters are forced out of the groove (in which the columns of letters are placed) into a line or channel running along the machine. The letters during this operation are held in their proper position by a box covered with leather, or other suitable material, on one side, for the purpose of forming a friction-pad to hold the types in their proper position till another instrument or part of the machine comes into operation to collect all such of the types as may be thrown up out of their grooves by the keys above-mentioned. *Patent abandoned.*

772. G. M. Todd. *The improvement of the sewing machine in such a manner that it shall form a new stitch, which he entitles the "tie-knot stitch.* Dated March 19, 1862.

This relates to shuttle machines, and consists in the formation of a new stitch in the following manner:—The needle carrying a thread passes down through the material to be sewn, and forms a loop, through which the shuttle (also carrying a thread) passes horizontally; the shuttle then passes over its own thread, which may be either in proceeding to, from, or in returning to its original position. The two threads when drawn up in proper tension by the motions of the shuttle, and the needle will form the tie-knot stitch. *Patent abandoned.*

773. B. Samuelson. *Improvements in chain harrows.* Dated March 20, 1862.

The patentee has found that the operation of chain harrowing can be more efficiently performed than hitherto, by causing those links which stand vertically, or a portion of them to present an angular or cutting edge. He effects this by bending the iron or steel of which the links are made, so as to present an angle towards the front; and he prefers to make the links out of iron or steel of a triangular section, but so that the apex of the triangle shall be towards the outside, and the base inside. It is not necessary that all the links should be bent or made to this form, but those whose planes are vertical and parallel to the line of draught. *Patent completed.*

774. J. G. T. Campbell. *Certain implements in ships' propellers.* Dated March 20, 1862.

This invention is not described apart from the drawings. *Patent abandoned.*

775. A. Hill. *An improved fastening for stays.* Dated March 20, 1862.

This fastening applies to those stays which are fastened in front, and consists of two parts; one a stud formed with an enlarged head, that is, a head of greater diameter than the shaft which carries it, is fitted to one of the busks or ends of the stay. The other part of the fastening is fixed to the other busk or other end of the stay, and consists of a button free to revolve upon a pin, and made with a metal shell on the under side thereof, formed with a circular slot, and with an enlarged aperture at the entrance into the slot. The fastening is effected by passing the enlarged aperture on the shell of the button over the stud; and by then turning the button to bring the slot over the head thereof, which being too large to pass through, the slot is retained in it. To unfasten, turn the button in the reverse direction until the enlarged aperture comes over the stud, when it willescape, and the two parts will become separated. *Patent completed.*

776. R. M. Roberts. *Improvements in obtaining and applying motive power.* Dated March 20, 1862.

This consists in using a weighted wheel, the weight being placed at a given point of the circumference thereof (or only a projecting lever or radius weighted at its end), such wheel or lever, or radius, having affixed to the axis or shaft thereof, and turning therewith an eccentric, so set on the axis that the rim of the eccentric shall always be nearest to the weight on the wheel (or lever, or radius aforesaid). This eccentric is to be arranged so as to continuously work into an eccentric opposite thereto, fixed in manner as aforesaid on the axis of another and similar weighted wheel, or lever, or radius. The two wheels and eccentrics so arranged cause the weights to traverse a portion of the circle, the one weight pulling opposite to the other; and, in order to traverse the other part of the circle two, four, or more precisely similar weighted wheels or levers and radii and eccentrics, working in conjunction as aforesaid, are connected by wheel gearing; for instance, with the aforesaid arrangement of weighted wheels, or levers, or radii and eccentrics. *Patent abandoned.*

777. E. Smith. *Improvements in means or apparatus for cutting stone, wood, and other material, which improvements are also applicable to modelling in plastic material.* Dated March 20, 1862.

The object here is, mainly, to give facility for obtaining copies of works of art, though the improvements are applicable to other productions. For this purpose, the tracing point for tracing over the surface or surfaces to be copied is supported at one end of a bar or frame, the other end of which carries a rotating or other suitable cutter for cutting into the material to be operated upon to produce the desired copy. The tracer and the cutter are held horizontally, or somewhat in that direction, by their bar or frame, which is capable of adjustment in a rod or frame, which, whilst suspended upon hinge joints from above, inclines somewhat from a vertical line, with a tendency to exert pressure, which pressure may be aided by a weight or by the hand of the operator regulating the amount of force exerted. The material to be operated upon is either placed upon a bed capable of rotating upon a vertical axis during the cutting action, so as to cut around it, or on a bed capable of moving in various directions. By varying the position of the cutting, or scraping instrument, in relation to the tracing instrument, and the axis or axes of motion of the carrier, an enlargement or reduction of the article copied may be obtained. *Patent completed.*

778. E. Field. *Improvements in regulating the flow of gaseous and other fluids.* Dated March 20, 1862.

This consists in causing the fluid the velocity of which is to be regulated to pass into a chamber, from which its exit must take place through or around a movable piston, diaphragm, plate, or leaf connected or formed with or attached to another piston, diaphragm, plate, or leaf, so that any variation in the velocity of the passing fluid, by acting upon one or other of the pistons, diaphragms, plates, or levers, shall cause the other to proportionately open or close the opening by which the fluid passes through the regulator. *Patent completed.*

779. W. Baddeley. *An improved method of preparing tobacco for smoking, and in the apparatus to be used for that purpose.* (A communication.) Dated March 20, 1862.

Here the tobacco leaves being moistened, are formed into rolls by hand, which rolls are passed between graduated ground rollers, which compress them, giving the required form and solidity. The roll thus formed is passed through a tube, in which it receives a glutinous coating, after which it is bound round with a thread or band, and then dried. When sufficiently dry it is fit for smoking in pipes. *Patent abandoned.*

780. W. Clark. *Improvements in the manufacture of soap.* (A communication.) Dated March 20, 1862.

This relates to making soft potash soap, or hard soda soap, with a sulphurous base, which soap may be used with advantage in all the ordinary applications of soap, especially for diseases of the skin. By the term sulphurous base the inventor simply wishes to imply that sulphurous matters are mixed with the ordinary soaps. *Patent abandoned.*

781. G. T. Bousfield. *Improvements in pianofortes, organs, harmoniums, and other instruments having keyboards.* Dated March 20, 1862.

This consists in the application to such instruments of an enharmonic scale, that is, a series of 41 sounds in each octave or settine, which will give in just intonation every major and minor scale in a series progressing upwards by fifths from C flat through C natural to C sharp, or from 7 flats through C natural to 7 sharps, to adapt the signatures generally used in music with the chromatic and enharmonic scale of each. Also in the application to such instruments of a key-board shifted by pedals, by which one is enabled to perform in any of the above scales at will (by shifting the board to the proper position), while one is using the fingering of the easiest scale, viz., C natural major and A natural minor. There are peculiarities in the way in which the keys are jointed and kept in their places. *Patent abandoned.*

782. D. E. Siebe. *Improvements in machinery or apparatus for refrigerating or producing cold, part of which improvements are applicable to other purposes.* Dated March 21, 1862.

The patentee claims, actuating the valves of air pumps by cams or other equivalent means, such cams being brought into action so as to open the valves at varying periods, corresponding with the requirements of the pressure in the pump for the time being of the air or other elastic fluid operated upon. 2. The arrangement of condensers wherein the current of condensing water is caused to flow in a direction contrary to that of the vapour to be condensed, and is kept throughout its course in intimate contact with the pipes, tubes, or chambers containing the vapour, substantially as described. 3. The construction of refrigerators with vertical tubes, as described. 4. The general arrangement and combination of parts constituting a regulator, as described. 5. The arrangement described for moving the ice-moulds successively upward towards the refrigerating power. *Patent completed.*

783. R. Kay. *Certain improvements in the method of printing calico and other surfaces, and in apparatus connected therewith.* Dated March 21, 1862.

This consists in the use of surface rollers constructed as follows:—The bed or internal portion of the roller or cylinder is composed of metal, and fits on to the ordinary mandril; such internal cylinder is to be covered or coated with gutta-percha, paper, papier-maché, india-rubber, vulcanite, plaster of Paris, glue, hide, or other substance not subject to injurious contraction and expansion, and which will give sufficient support to the delineating wire or type metal casting used to define the edges of the pattern. This gutta-percha or other materials is removed when the design is outlined for the india-rubber surface to be inlaid.

When the design is outlined with the valve or type, and the exterior cut away as usual, the portion within the wire is also to be removed, and the excavation or intervals filled with india-rubber or gutta-percha, in place of felt (as sometimes similarly employed), the surface of the india-rubber being previously grooved parallel to the length of the rollers to retain the colouring matter. By this means the method of printing surfaces is improved, inasmuch as the grooved india-rubber yields its colouring matter more freely than wood or felt, and from its own elasticity yields to the pressure without forcing the colour too deeply into the cloth, and clearer and more perfect impressions are obtained. *Patent completed.*

784. W. J. CURTIS. *An apparatus to ascertain and point out the fares and earnings or receipts of public vehicles and their conductors.* Dated March 21, 1862.

One mode of carrying out this invention consists in connecting a wheel or the wheels of a carriage with a dial or indicator, by an endless chain passing round the nave of a wheel, and also over a pulley fixed to a shaft working the indicator; or any other mode of connection may be adopted. This dial shows to the passengers the space the carriage passes over. Connected with the dial may be a cylinder or box, containing a column of cards or tickets, which will move in exact agreement with the dial, the movement of which stops when the carriage stops. A punch, forming part of the machine, nicks or marks the tickets in exact correspondence with the dial, when given to the passenger by the conductor on entering the carriage, and it may be again marked in uniformity with the dial when the passenger leaves the carriage, thus showing the fare to be paid. *Patent abandoned.*

785. J. NEWALL. *Improvements in supplying gas to railway carriages, stations, steamboats, and other vessels, omnibuses, or other carriages, at any required pressure.* Dated March 21, 1862.

Here the patentee uses a vessel or cylinder of any convenient shape and dimensions to compress gas by water, or rather liquids, previous to its being conveyed to its distination for use. To the said vessel or cylinder he attaches a water gauge, a gas feed pipe for supplying the same, another pipe for supplying the compartments or places, a water gauge, a water exit pipe, and a supply pipe for conveying the water into the said vessel to compress the gas. He first fills the cylinder with water from high-pressure water pipes to drive out the atmosphere, or any impure air. He then opens the water exit valve or tap to let the water out, and then admits gas into the vessel or cylinder to supply the partial vacuum created by the exit of the water. When the water is nearly all run out, and the vessel or cylinder is full of gas, he closes both the exit valve or tap, and also the gas valve or tap. To compress the gas, he then admits water at any necessary pressure, which may be supplied from different sources—as an elevated tank or reservoir, street water mains, force pumps, or other means. When he has compressed the gas into the vessel or cylinder, he passes it into a holder fixed in part of a carriage compartment, cabin, or place required, and he then applies valves or apparatus to reduce the gas from high pressure to any ordinary burning pressure that may be required, either for heating or lighting purposes. For warming or heating railway carriages or other places, he places a small cylinder, or other shaped vessel, in a part of the carriage, compartment, cabin, or other required place, and fixes a jet or burner inside thereof, to be lit when necessary; the heat from the said small vessel with the burning gas inside will warm the room or compartment where so placed. *Patent completed.*

786. J. M. HART. *Improvements in means of generating steam.* Dated March 21, 1862.

Here the steam is first generated in a boiler of any form. The steam is then conducted into superheating pipes or chambers of a form and structure suited to the boiler to which it is arranged. While the steam passes from the boiler to the engine, or other apparatus wherein high steam is required, it must of necessity come in contact with the heated surface of the superheating pipes, which are made of cast or wrought iron or copper; the metal in the heated state absorbs oxygen from the steam, and becomes oxydized, hence a rapid destruction of the material ensues. To prevent this, they fill the superheating pipes or chambers with a granulated material broken into suitable sizes, or of a moulded material moulded into such forms as will expose the greatest amount of transmitting surface, composed of either earthy, metallic, or the ores of metals, or of carbonaceous compounds, either animal, vegetable, or mineral, or of any material which will take up heat from the superheating pipes and again readily transmit it to the steam as it comes into contact with its surface; at the same time, the same material will absorb oxygen. *Patent completed.*

787. J. FAWCETT. *Improvements in the manufacture of soap, particularly applicable to the scouring, cleansing, and fulling of woollen or other cloths.* Dated March 21, 1862.

The patentee claims the application, use, and addition of the jelly produced from lichen or moss, to alkalis and oily or fatty matters, in order to manufacture soap. *Patent completed.*

788. J. HUMPHRYS. *Improvements in steam-engines.* Dated March 21, 1862.

The first part of this invention consists of a novel description of slide-valve, applicable to such engines, whereby with great simplicity of construction considerable economy is effected in the transmission of the steam from the high pressure to the low pressure cylinder. The valve is a treble-ported slide-valve; the laps at the extreme ends of the valve cut off from and supply to the small cylinder the high pressure steam from the boiler. The steam, after having acted on the piston of the small cylinder, is conveyed through a passage, forming part of the valve, into the large cylinder, which it enters and leaves for the condenser by the inner portion of the valve, which portion is an ordinary double-ported slide-valve. The second part of the invention consists of improvements in the arrangement of the parts of compound engines, whereby great simplicity and accessibility are obtained. These engines may be vertical or placed at any angle with the horizon, but arranged horizontally. They are particularly adapted for driving the screw. The small cylinder for the high pressure steam is placed within the large cylinder, so that the outer piston is an annulus; this annulus has two rods, and the small piston has one rod; these three rods are attached to a crosshead working in guides forming part of the main A frames of the engine. From this crosshead a connecting rod with a wide fork at the crosshead end is attached to the crank pin. The eccentrics and their rods for working the slides are placed outside the outer bearing of the crank shaft. *Patent completed.*

789. B. H. MATHEU. *Improvements in fire-arms and in cartridges.* Dated March 21, 1862.

This invention relates to large and small arms and ordnance, and comprises—first, a new arrangement of parts for breech-loading arms; second, a new method of rifling arms; third, an improved back sight for arms; fourth, an improved cartridge for breech-loading arms. The patentee constructs his breech-loading arms as hereafter explained. At the rear end of an ordinary barrel he forms a longitudinal aperture, and at the back of that aperture he forms a transverse cylindrical hole for the reception of a curvilinear wedge. The longitudinal aperture is filled and covered by a solid plunger, the face of which bears against the end of the barrel proper; the rear end of the plunger is formed with a hollow curve to receive the curvilinear surface of the wedge. The curvilinear wedge is furnished on one side with a projection which forms a crank, the pin of which is inserted in a slot of a side lever, the fore end of which is attached to the fore part of the plunger or barrel, while the back end terminates in a handle for opening and closing the breech. The improved cartridge to be used with the breech before described consists in forming the case with a flange projecting from the rear, and with a tail carried from the flange, in the end of which a percussion cap is inserted. For other than the system of breech before described, and in some cases even for that system, he dispenses with the tail. The flange being compressed between the fixed and movable breech assists in rendering the breech gas-tight. The method of rifling consists in forming the grooves in such manner that the projectile shall be upheld truly and continuously during its passage through the barrel. The improved back sight is formed by imparting an additional and independent vertical motion to the ordinary notch, and by adding thereto two points capable of lateral adjustment to and from each other. *Patent completed.*

790. W. PHELPS. *An improved woven fabric, and improvements in machinery for manufacturing the same.* Dated March 21, 1862.

This improved fabric very closely resembles crotchet work, and is produced upon the bobbin net or twist lace machine altered to adapt it to produce the fabric. The improvements in the machine consist in adapting to it two stump bars instead of one, and in arranging the parts in such manner that, while one stands still, the other is made to move two or three gates for two motions, then that which was stationary comes into action, the other stands still, and so on. The pattern on the fabric is produced by the Jacquard in the ordinary manner. *Patent abandoned.*

791. J. WARBRICK and W. WARBRICK. *Improvements in engines for carding cotton and other fibrous materials.* Dated March 21, 1862.

This relates to an arrangement of mechanism for stripping the fibrous material from the doffers of carding engines, and consists in the use of a shaft placed parallel to, and in front of the doffer, as supported in bearings, by which it can be adjusted; this shaft carries arms, adjustable in length, to which the doffer comb is attached. Rapid oscillating motion is given to this shaft by a friction wheel (placed upon the axis of the main card cylinder) working in close contact with a small friction pulley carried upon a stud fixed in a bracket secured to the framing, and in this small friction pulley a crank pin is fixed, which is connected by a rod with an adjustable pin carried by an arm on the end of the shaft pulley in front of the doffer. *Patent abandoned.*

792. W. CLARK. *Improvements in sewing machines, which improvements are partly applicable to other machinery for giving a rotating motion always in the same direction.* (A communication.) Dated March 21, 1862.

This invention is not described apart from the drawings. *Patent abandoned,*

793. D. ABERCROMBIE. *Improvements in power-looms.* Dated March 22, 1862.

The patentee claims actuating the treadles or shedding levers of a power-loom by cams or tappets driven by a clutch, which can be kept out of gear during one or more picks, and so cause a shed to be kept unchanged during two or more picks, as described. *Patent completed.*

794. J. MARSH. *An improvement or improvements in harness for horses and other draught animals.* Dated March 22, 1862.

This consists in making the draught plates of harness movable along a grooved bar or axis on the said harness, so as to permit the pressure of the draught plate to be more accurately adjusted to the shoulder of the horse or other animal than it is in draught plates of the usual construction. *Patent completed.*

795. T. FONTENAY. *Improvements in smoke-consuming furnaces.* Dated March 22, 1862.

In the improved furnace the smoke evolved by the fresh fuel with which the furnace is fed, while receiving a proper supply of air, is caused to meet or mix (by preference as much as possible at a right angle) with the bright flame arising from that part of the fuel already in a highly incandescent state, and not emitting any visible smoke, by which the undecomposed particles of carbon contained in the smoke arising from the fresh fuel will, while being mixed with the necessary quantity of atmospheric air, be brought to the degree of heat required for combining with the oxygen of this air, and thus be transformed into the gaseous state as carbonic acid or oxide of carbon. *Patent completed.*

796. E. OWEN. *Certain improvements in the hydraulic engines known as turbines.* Dated March 22, 1862.

This consists in applying a perforated annular shield between the centre aperture and the buckets through which the water passes. The perforations are so made that, when the shield is in one position, the greatest quantity of water can pass to the buckets; when lowered or raised a short distance, a fresh set of perforations is brought into position for admitting only a part of the water, and when the position of the shield is again altered, another set of perforations is brought into position to shut off still more of the water. Any number of sets of perforations can be used, according to the variations in the power required to be exerted by the turbine. *Patent abandoned.*

797. E. LORD. *Improvements in certain machines for preparing cotton and other fibrous substances.* Dated March 22, 1862.

This is applicable to slubbing frames, roving frames, and other machines of a similar nature, and it consists, 1st, in an improved mode of arranging and constructing the differential motion, whereby less friction is produced, and, consequently, less power is required for driving the machine; 2nd, in the application of machinery for unwinding so much of the slubbing or roving off the full bobbins as will suffice for lashing or winding on to the empty bobbins or spools at the commencement of a fresh set. The object of the last part is to facilitate the operation of regulating the winding on according to the tension of the slubbing or roving. The invention is not described apart from the drawings. *Patent completed.*

798. J. DAVIS. *Improvements in wind musical instruments.* Dated March 22, 1862.

This relates to cornets and other wind instruments, and consists, 1st, in a mode of working the valve. The shaft or plug which works the valve passes into a tube projecting from the face plate, which shaft has a part cut away, so that its end may enter a slot in a short plug projecting from the valve. The shaft is provided with a shoulder, and there is a cap over its outer end to keep it steady. To the bottom of the piston rod is jointed a pin, which passes through a hole in the shaft, and acts as a lever for working the shaft and valve. By these arrangements the patentee obtains a steady working of the centre, and perpendicular action of the piston rod perfectly free from oscillation. 2nd, he constructs a chamber on the face plate, within which chamber the aforesaid chamber is made to work, the whole action being enclosed by a cap. In one arrangement he conveys the wind from the lower chamber of one valve through the upper chamber of the next, or *vice versa*. These chambers are immediately attached to each other, but not at equal distances apart, nor yet in the same line, for the purpose of bringing the finger plates central with the spring boxes, and at equal and convenient distances apart; or he obtains the same advantage by causing the chambers containing the valves to be placed in an oblique direction, and having the wind passages arranged accordingly. To regulate the position of the valve so that the apertures may be opposite the wind passages in action, he employs a circular plate, having upon it another plate partly circular, or with a portion cut away, and causes the plate to be held in the chamber. At the end of the valve there is a pin or projection, which comes in contact with the edges of the plate, and prevents the valve from being turned too far. *Patent completed.*

799. R. GLADSTONE. *Certain improvements in tilting or tipping waggons.* Dated March 22, 1862.

The first part of this relates to a form of axle by which the body of a waggon, either with or without springs, can be evenly balanced, and complete end tilting or tippling effected, and consists in bending or cranking the said axle immediately after it leaves the naves of the wheels a sufficient length horizontally or angularly towards a vertical line drawn transversely through the centre of the waggon, so that when the waggon is completely tilted or tipped endwise, it will not come in contact with the longest part of the said axle which was parallel to a line continued from one end bearing part to the other. The second part is only applicable to four-wheeled waggons with fore carriage, and consists in forming the connecting rod, which is secured to, or made part of, the axle of the hind wheel by bending it upwards and forwards, so that it will pass over the fore carriage or carriage part and couple to the main pin or "perch bolt" of the same, thus allowing the said fore carriage to turn on a small surface. *Patent completed.*

800. F. W. COLLS. *Improvements in consuming smoke, and in the apparatus connected therewith.* Dated March 22, 1862.

This consists in passing steam through pipes into the interior of the furnace, so that the steam may be superheated and decomposed into its original inflammable gases, which are discharged near the bridge of the furnace, and by uniting with the smoke cause its perfect combustion. *Patent abandoned.*

801. J. H. TUCK. *Improvements in the manufacture of flexible valves.* Dated March 22, 1862.

Here it is preferred that the valves should be made of vulcanized india-rubber. In constructing a circular or other form of valve, where the same is held by a spindle passing through it, a ring of metal or of other strong material is introduced into the interior or substance of the valve around and concentric with the hole through which the spindle passes. The object of such rings is to give additional strength to the central parts of the valve, and that the play or movement of the valves may be for the most part external of such strengthening rings. In some cases, near the outer circumference of the valve, and at a distance from the ring above-mentioned, another ring of metal, or of other suitably strong material, is introduced into the substance of the valve, which ring may, when desired, be itself flexible by being formed of links or parts connected together, if of metal or other hard material. *Patent completed.*

802. J. G. Jennings. *Improvements in the manufacture of biscuits.* Dated March 22, 1862.

Here the biscuits are made hollow, and baked so as to remain so, which can be done by filling with a piece of metal or glass, &c., which can be removed after the baking. These biscuits can at any time be filled with mince, jam, meat, &c., and thus become sandwiches. *Patent completed.*

803. T. M. Smith. *Improvements in the manufacture of candles.* Dated March 22, 1862.

This consists in combining Japan or vegetable wax with paraffin, which being melted together, either with or without other candle-making materials, make a valuable, yet a comparatively inexpensive, candle stuff. *Patent abandoned.*

804. T. F. Hale. *Improvements in valves.* Dated March 22, 1862.

This invention consists of a flat plug, corrugated or formed with annular grooves, and of a flat surface or seat surrounding the aperture to be opened or closed. The plug is forced down upon the seat to close the aperture, and is raised therefrom to open it by screw or lever. Instead of the face of the plug being grooved, the inventor sometimes makes it with an even surface and grooves or corrugates the seat. *Patent abandoned.*

805. W. Holiday. *Improvements in the manufacture of press plates.* Dated March 22, 1862.

Upon a plate of wrought-iron of about the size of the intended plate, the patentee places a quadrangular frame of about the same size of wrought metal, and within this frame he applies transverse bars of thickness similar to that of the quadrangular frame. Each of these bars is at one end fitted into a recess formed in the side of the quadrangular frame, whilst their opposite ends extend to within a short distance of the opposite side of the frame. The points of connection of these bars with the side of the frame alternate so as to leave a continuous but circuitous course from one angle to the opposite. Upon this frame and the intersecting bars he then applies another plate, and subjects the whole to a welding heat, and then to mechanical pressure sufficient to produce a welding of the surfaces in contact, yet so as to leave the channel referred to clear. He then finishes the surfaces of such plates as may be required, and applies suitable nozzles to the opposite extremities of the channel therein for the conduct, thereto and from, of heating or cooling media. *Patent completed.*

806. G. Hartshorne, jun., D. G. Ward, and W. Woolley. *Improvements in punching or perforating metal plates or sheets, and in apparatus or machinery to be employed for that purpose.* Dated March 22, 1862.

Here the patentees make two plates, termed he and she plates. The he plate is furnished with a number of pegs or projections extending up from its surface. The she plate is made with a corresponding number of holes or sinkings. The plate or sheet of metal to be pierced is then placed between these plates, and all are enclosed between two plain plates, one on the top and one underneath. The whole of these plates are then passed between rolls, and by the pressure of the rolls the pegs or projecting parts pierce the plates, and thus plates with a vast number of perforations are rapidly and economically produced. *Patent completed.*

807. M. Henry. *Improvements in kilns, ovens, and furnaces.* (A communication.) Dated March 22, 1862.

This relates to kilns, ovens, and furnaces for calcining lime, plaster, and bones, revivifying animal charcoal, burning bricks, baking or firing pottery, porcelain, and retorts, and performing other operations. In one arrangement, the kiln or oven is constructed with a sole or floor, through which numerous openings called inlet-holes are formed; furnaces or fire-places are placed directly under this sole, or nearly so, and from them the flames and hot gases or products of combustion rise through the openings in the sole into the kiln, oven, or chamber, and act on the materials or articles therein. Other openings called outlet holes may sometimes be formed through the sole, for the escape of the gaseous products from the kiln, oven, or apparatus to the chimney or elsewhere, and in this case the rows of inlet-holes should cross the row or rows of outlet valves, which may be arranged across or near the middle of the sole, the object being that the products of combustion, when acting on the matters, may be in the form of films or sheets of heat or flame. It is preferred that the whole surface of the sole should be provided with openings or holes, and that the inlet-holes should be of small sectional area, as heat is more equally diffused when entering through narrow openings than through broad flues. Blocks of brick or other ordinary contrivances may be used for reducing the sectional area of the passage through the holes to any required extent, by which the inlet-holes furthest from the fire may be opened widest, and the area of passage through the outlet-holes may be regulated according to their vicinity to the main exit flue. Doors or panels mounted on wheels or rollers, which travel on rails, may be used for opening and closing the kiln or oven to admit and remove the charges. *Patent completed.*

808. J. H. Brierley. *An improved clasp or fastener for reversible belts, bands, or straps.* Dated March 24, 1862.

Here the patentee uses one plate of metal, or other material, of any design suitable for a belt clasp, to the centre of which he attaches a bar of suitable width. He further attaches two hooks, or a double hook, or other kind of fastening, in such a position as enables him, by a catch formed out of metal, and attached to one end of the belt, band, or strap, and the clasp before described to the other end, to connect the ends of the belt, &c., either on the right or left of the clasp, so that, by connecting the belt, &c., on the right of the clasp, one side of the belt, &c., is seen, and by connecting it on the left, the reverse side of the belt, &c., is seen, and thus produces a reversible belt, &c. *Patent completed.*

809. J. Clarke. *An improvement or improvements in carriage axles.* Dated March 24, 1862.

This relates to carriage axles of the kind known in commerce as collinge axles, and consists in an arrangement for fixing upon the end of the arm of the axle, the collet or washer against which the end of the axle box works. *Patent abandoned.*

810. T. White. *Improvements in the manufacture and ornamentation of nut-crackers, and lobster-crackers.* Dated March 24, 1862.

This consists, 1st, in constructing the joints of nut-crackers and lobster-crackers in manner hereinafter described. Instead of connecting the two parts of the joint with the middle pieces by pins or axes riveted at their ends, the patentee uses pins or axes of iron, or German silver, or other metal or alloy, which are passed through the parts to be joined, and are left unriveted. The pins or axles are kept in their places by small ornamental caps fixed over them, the said caps being secured by soldering or otherwise, in depressions made in the sides of the cracker to receive them. He makes the handles of a cylindrical or prismatic figure, and fixes thereon tubes of metal, ivory, bone, &c. *Patent completed.*

811. S. E. Turner. *An improved apparatus for burning a mixture of inflammable gas and air.* Dated March 24, 1862.

This consists in introducing one or more metal tubes into the cylinder in which the jet is placed, wherein the mixture of the gas and air takes place, which tube or tubes is, or are open at bottom, and pass up through a gauge or perforated diaphragm, and into the chamber in which the combustion takes place, where it is or they are finely perforated, and is or are by preference closed at the top; or a tube or tubes of wire gauges may be used instead of the perforated portion of such tube or tubes. *Patent abandoned.*

812. C. M. Roullier. *Improvements in flat cables or chains.* Dated March 24, 1862.

This invention consists in constructing flat cables or chains as hereafter explained. The inventor takes links of hard wood, and strings them upon metal spindles. The links are formed with grooves on the face, in which wire is wound to strengthen the wood, and with metal plates on the sides, which plates may be alternately zinc and copper, and which, when the cable is complete, should be in contact with each other. The metal spindles may be covered with caoutchouc or gutta percha to impart suppleness and elasticity to the joints, and to prevent the effects of wet and damp. The links also should be coated with caoutchouc or gutta percha. Two spindles pass through every link, one near one end and the other near the opposite end of the link. *Patent abandoned.*

813. B. Fleet. *Improvements in apparatus for manufacturing and bottling soda water.* Dated March 24, 1862.

This relates, first, to combining in one machine the apparatus for making soda water, and a steam engine for driving the same, the same shaft and fly wheel answering the purpose of both, as also, to a great extent, the same framing. This is readily effected by disposing a steam cylinder on the bed plate of the machine, or other supporting part, and mounting a crank on the end of the machine shaft to which the piston rod may be directly connected, or it may be otherwise arranged. A suitable feed is also applied to supply the boiler. The second part relates to the lifting apparatus. This the patentee disposes at that part of the machine from which the soda water is ordinarily drawn and as bottled by hand, by which and other arrangements the soda water is even better than that bottled by hand, and infinitely superior to that bottled by rack-bottling machines. The channel in which he places the cork, guiding and forcing it into the bottle, he forms cylindrical, and fits therein a plunger, by which the cork is driven into the bottle. The plunger has a cap, leather or other packing, near the nose, which fits the cylindrical passage receiving the cork, and prevents the escape of gas upwards, while the bottle neck being pressed upwards against a soft substance at the lower part, as usual, prevents any escape thereat. The soda water enters the cylindrical channel below the position of the cork, and when the bottle is filled, the cork is forced down by the plunger into the bottle, thus easily and effectually bottling the soda water. The plunger is brought down by a screw of rapid pitch (an eight-thread screw), so that about one half a turn is sufficient, which forms a feature of this invention. *Patent completed.*

814. J. Topham. *Improvements in apparatus used for cleansing out the scum and removing the sediment from the water in steam boilers, and preventing incrustation therein.* Dated March 24, 1862.

We cannot here devote space to the voluminous details of this invention. *Patent completed.*

815. E. Morewood and A. Whytock. *Improvements in the process of coating metals, and in the apparatus employed.* Dated March 24, 1862.

This invention relates to the use of resin, or a mixture of resin and tallow, as a flux on the surface of melted lead or tin, or alloys of those metals, when coating iron or other metal, by using two or more coating baths, worked in connection by the aid of machinery, which causes the sheets to pass from one bath to the other whilst in the process of coating. *Patent completed.*

816. W. Hensow. *Improvements in knitting machinery.* Dated March 24, 1862.

This consists in so arranging such machinery that the number of needles in the circle or ring may from time to time be increased or decreased by causing needles to be introduced into or withdrawn from the circle or ring, the circle or ring carrying the needles being at the same time proportionately increased or decreased, so that the needles which are for the time being at work may be equally spaced. *Patent abandoned.*

817. J. Stewart. *Improvements in the manufacture of cards for jacquard weaving.* (A communication.) Dated March 24, 1862.

This relates to a system of removing the cards used in jacquard weaving mechanism, so as to avoid waste of material. Under one modification an old card is taken, and the layers of paper which form the card are stripped asunder, and to each layer or half of one card is glued or otherwise cemented a new strip or length of card paper. The remaining half of the card is in like manner glued or cemented to another strip of card paper, so the parts again form two perfect cards, and when joined in this manner to the new card paper are again ready for being punched. The cards thus prepared are subsequently submitted to pressure in any convenient way, so as to cause the layers of cardboard to adhere firmly together, so forming two new cards. *Patent completed.*

818. M. A. F. Mennons. *Certain improvements in machinery for the production of ornamental stitching or embroidery.* (A communication.) Dated March 22, 1862.

This invention is not described apart from the drawings. *Patent completed.*

819. E. Molyneux, Jun. *Improvements in air, gas, and vapour engines.* Dated March 25, 1862.

This consists in a method of alternately heating and cooling air, gas, or vapour confined in an air-tight vessel or vessels, and using the resulting difference of elastic force due to this difference of temperature to produce motive power. *Patent abandoned.*

820. A. H. Renton and E. Cottam. *Improvements in apparatus for steering ships.* Dated March 25, 1862.

This relates to apparatus for moving the rudder or rudders of ships, and consists in applying the power to a tiller or other lever which is usually attached to the rudder head by a hydraulic cylinder and piston of a particular construction, and also in actuating the same by pumps or cylinders and pistons driven or worked by steam or other agent, as convenience and circumstances may suggest. *Patent abandoned.*

821. W. Beaumont and J. W. Edge. *Improvements in sights for rifles.* Dated March 25, 1862.

This consists of a back sight for rifles, and relates to that description of sight in which the elevating bar has been hitherto raised by a screw working through a bearing in the back part of the elevating bar. These improvements consist in using two screws, one on each side of the back of the framework, and in fixing on the tops of the screws small toothed wheels, which turn simultaneously by one or more additional or intermediate wheels. The elevating bar, which is tapped to receive the two screws, is raised or lowered by turning one of these small wheels either to the right or left. The number of teeth on the wheels which are connected to the screws for raising or lowering the elevating bar are so arranged, in proportion to the pitch of the screws, that one revolution shall be equal to one degree or half a degree, as required, of elevation. The screws which raise or lower the elevating bar may be made of double or treble threads, if found necessary, so as to give a quicker movement to the elevating box. The plate of the sliding or elevating bar containing the V-grooved or other formed sight, is so constructed that, by simply unscrewing two small screws at its base, it may be removed from its framework in order that the marksman may alter his sighting by exchanging the plate for one with a different shaped notch or V-piece, or a larger or smaller aperture through which to take the sight, according to the weather or other circumstances, as is well understood. *Patent completed.*

822. A. Fryer. *Improvements in the manufacture of sugar, and in separating liquids from sugar and other substances.* Dated March 25, 1862.

This invention consists, first, in a method of crystalizing the sugar held in syrups. The inventor stores the syrups when boiled in what he terms a crystallizing vessel of large capacity and great depth. He prefers that the vessel shall not hold less than 50 tons, nor be of less depth than 30 feet, the larger and deeper the better. The crystalizing vessel is kept nearly full, and the saccharine matter drawn off from the lower end, and is, for convenience of after treatment, led thence by a pipe into a small discharging tank, fixed nearly as high as the top of the crystallizing vessel. By this method the boiled syrup cools slowly, and the lower portions being removed, as fresh boiled syrup is added at the top, each portion of material, in its downward course, is subjected to gradually increasing, and eventually to considerable pressure, which, together with slow cooling and length of time, produces a more than ordinary copious crystalization. As it is better not to allow the temperature of the sugar to fall below 105 Fahr., he surrounds the vessel, if needful, and especially if such be of small diameter as the minimum aforesaid, with a casing, or employs other means to maintain the temperature. The second part of the invention consists in a new method of and arrangement of apparatus for separating sugar from syrup, and for the removal of liquids from solids generally. In explaining this part of the invention the patentee supposes he is operating on saccharine matter that has passed through the crystalizing vessel to the discharging tank before referred to. The separation of the sugar from the syrup is thus effected:—He folds portions of the saccharine matter in cloths or other porous material forming parcels, and he places these parcels one upon another until they form a pile or column from about 20 to 50 feet high or upwards. Each parcel is thus subjected to a gradually increasing pressure, commencing at first within superincumbent pressure, and eventually receiving the pressure due to the whole column. The syrup is thereby forced through the pores of the cloth, while the sugar is retained. The pile is kept constantly full; fresh parcels are added at the top, and the pressed ones are removed from the bottom. It is better that each parcel should be 24 hours under operation. Each parcel is separated from those above and below it by an open or reticulated plate to allow the syrup to escape freely; the whole column is retained in a vertical position by a strong framework. This framework is most conveniently placed under the valve of the discharge tank, and the material is then filled into the cloths direct. Beneath the pile a hydraulic lifting apparatus is fixed, by means of which, in combination with bars and beams for supporting the weight of the pile, the whole pile is lowered and the lower parcels are released from the superincumbent weight, and may thus be removed. *Patent completed.*

823. A. M. SILBER. *An improved fastening for purses, pocket-books, bags, and other articles.* (A communication.) Dated March 25, 1862.

Here to a plate or piece, hereinafter called a fixed or guide plate, attached to a part of the article to be fastened, is connected another plate or piece, hereinafter called a catch plate, capable or moving or working to and fro, moving in one direction to open the fastening, and in the opposite direction to close it. Two spiral springs are fitted at one of their ends to the fixed or guide plate, and at their opposite ends to the catch plate, being most conveniently connected to these plates by bent parts of the latter introduced into the ends of the springs. The catch plate has a beviled, bent, or otherwise formed part intended to act as a catch or staple to retain or engage a hook or equivalent contrivance, which is attached to another part of the article, and constitutes the second portion of the fastening, the combined catch plate, fixed or guide plate and springs composing the first portion thereof. The catch plate and fixed plate have openings in them for the hook or equivalent to pass. Those ends of the spring that are on the fixed plate are those nearest to the point or side towards which the catch plate is drawn where moved in order to open the fastening, and the ends on the catch plate are those furthest from such point or side, consequently the act of drawing the catch plate to open the fastening compresses the springs; and the act of releasing the catch plate, or causing or allowing it to return to position to close the fastening, causes the springs to return or extend to their previous form. When the catch plate and hook are engaged the fastening is closed. To open it the catch plate is drawn or pulled, compressing the springs, and the hook or equivalent is released. *Patent abandoned.*

824. T. GUTBAL. *Improvements in the construction of ventilators for the ventilation of mines and furnaces.* Dated March 25, 1862.

The patentee claims the arrangement of a rotatory ventilator or fan, the case of which communicated with an outlet passage increasing in sectional area as it passes away from the case, and which has a regulating sieve following the curve of the case to adjust the size of the outlet therefrom, as described. *Patent completed.*

825. E. MOREWOOD and A. WHYTOCK. *Improvements in the manufacture of shaping of iron or other material.* Dated March 25, 1862.

The patentee claims, 1st, the production of corrugations on sheets of iron or other material, by passing them widthways between, under, or against two or more pairs of fluted rollers, as described; 2. The use of a roller and bed for the same purpose, as described; 3. The causing sheets of iron or other metal connected together into a long or continuous sheet to pass widthways under or against a fluted, undulated, or corrugated roller, when working in connection with a bed, or to pass widthways between or against one or more pairs of fluted, undulated, or corrugated rollers, so as to be impressed or corrugated, as described, without tearing it. *Patent completed.*

826. W. PALMER. *Improvements in lamps.* Dated March 25, 1862.

Here a vessel is formed with two compartments, the oil being placed in the upper, from which one or more tubes proceed, according to the number of burners required, and the oil or fluid descends through the tube or tubes to the burners. From each burner of the lamp, another tube proceeds to the vessel, the other end of such tube being connected to the lower compartment of the vessel, so that the oil that overflows from the burner descends through such tube into the lower compartment of the vessel. In the lower compartment there is a plunger or piston, which, on being raised, carries up the oil, and causes it to pass through a valve in the partition which divides the upper from the lower compartment of the vessel, and thus is the oil which overflows returned to the upper compartment of the vessel. *Patent abandoned.*

827. C. CULLING. *Improvements in fire-arms.* Dated March 25, 1862.

This consists in applying a cheek-rest or cushion to that part of the stock of a fire-arm against which the cheek of the person when aiming is pressed. The rest or cushion is constantly pressed outwards by the action of a spring, and is in connection with a bolt, catch, or detent, which acts on and retains the hammer or trigger or other parts of the lock from movement, until the rest or cushion is depressed by the cheek pressing upon it, and then the motion of the rest or cushion is imparted to the bolt, catch, or detent, which moves so as to leave the lock free to act. *Patent abandoned.*

828. W. CLISSOLD. *Improvements in carding engines.* Dated March 25, 1862.

This invention is not described apart from the drawings. *Patent completed.*

829. J. T. LOFT. *Improved machinery for covering strips of metal and wire.* Dated March 25, 1862.

Here, in covering crinoline steel, the patentee prepares narrow ribbons or strips of woven or felted fabric, and encloses the steel or other metal strips in the fabric by lapping the fabric around the metal, using for the purpose special arrangements of machinery. *Patent completed.*

830. L. DE LA PEYROUSE. *Improvements in the preservation of animal substances.* Dated March 26, 1862.

According to this invention hides, skin, wool, and a variety of other animal substances, are treated according to a certain process with solutions of the compounds of chloride with magnesium, either alone or in combination with other chlorides, either of the metals or of the alkaline earths, or of the alkalies, or with other suitable salts of the metals, of the alkaline earths, or of the alkalies. *Patent completed.*

831. J. H. JOHNSON. *Improvements in apparatus for cleaning tubes and flues of steam boilers and similar conduits.* (A communication.) Dated March 26, 1862.

This consists in the use of the rush known in South America as "piagava" or "bastin," either as an entire substitute for bristles or tufts of wire, or combined with those substances. The tufts of rushes are fixed in any convenient way into a stack of wood, or into branches or stems of wire, and are then trimmed to a cylindrical or other desirable form. *Patent completed.*

832. J. WILSON. *Improvements in the apparatus for, and in the method of hot-pressing or finishing plaids, shawls, handkerchiefs, and other woven fabrics.* Dated March 26, 1862.

The object here is to obviate the evils resulting from the use of small presses, and consists in placing blocks of wood or metal across or along the platten of the press, such blocks projecting over the sides or ends, as the case may be, of the platten to an extent corresponding to the length and width of the plaids, shawls, or other goods to be operated upon. The patentee uses heated plates in the operation of pressing. *Patent completed.*

833. J. PARKER. *Improvements in steam-engines and in apparatus connected therewith.* (A communication.) Dated March 26, 1862.

This consists in the means for regulating the discharge of steam from steam cylinders, so as to avoid or reduce the back pressure, especially when working steam expansively; 2, in means for allowing the escape of the condensed water from steam pipes or other passages or chambers; 3, in means to facilitate the removal of condensed water from steam cylinders. We cannot give space to the details. *Patent completed.*

834. W. J. TAYLOR. *An improved method of colouring Portland cement for plain and ornamental plasterer's work on the walls of buildings and other erections.* Dated March 26, 1862.

This consists in the addition of colouring matter to Portland cement previous to its being used for plastering purposes. *Patent abandoned.*

835. H. NUNN. *Improvements in the construction of mangles.* Dated March 26, 1862.

The object of the first part of this invention is in improved mechanism for giving motion to the ordinary box mangle, and consists in converting and transferring the continuous rotatory motion of the main driving axis into an alternating rectilinear to-and-fro movement of the travelling weight. Another part consists in arranging apparatus for lifting the end of the box or travelling weight when it arrives at either end of its journey. Another part consists in forming the box or moving weight in compartments, so that such compartments may receive closed vessels containing water or other fluids or matters capable of being readily discharged therefrom when required. *Patent completed.*

836. R. BOBY. *Improvements in hay-making machines.* Dated March 26, 1862.

In these machines the several parts operate with equal effect in either direction. The teeth, or tines, are made straight, so that in whichever direction the rotating frame may be driven, the teeth will act properly on the hay. The reverse action of the rotating frame is obtained by double pinions, which are capable of sliding along their shaft or axle, so that they may be put in gear with the driving cogwheel affixed to the spokes of the travelling wheels of the machine when required. The shafts are adapted to a hollow front bar, which carries part of the disc adjustment, and they are therefore capable of being turned upon a central point or axis, which will admit of the travelling wheels being lifted off the ground, so that they may be removed or taken off their axles without inconvenience. The fork heads that carry the teeth project beyond the circumference of the running wheels, and therefore when the fork heads are lowered, they will form a fulcrum on which the machine will rest when the wheels are to be lifted off the ground. *Patent completed.*

837. J. BOOTHMAN. *Improvements in beehives and apparatus connected therewith.* Dated March 26, 1862.

We cannot here quote the voluminous details of this invention. *Patent abandoned.*

838. J. TAYLOR and C. H. MINCHIN. *A suspender or improved gallery for supporting the shades of gas or other lights.* Dated March 26, 1862.

Here the inventors make a fixing bending a little upwards, which fixing is screwed on the gas fitting, so that the flame of gas issuing from the said fixing will ascend as nearly as possible vertically, and thus avoid the danger of breaking the shade. To this fixing they attach an elastic spring or clip, to support the globe or shade, which will hold or support it without the aid of the ordinary thumb screws and hooks. *Patent abandoned.*

839. H. CARR. *Improvements in applying lubricating fluids to the journals of railway carriages and locomotive engines.* Dated March 26, 1862.

This consists in effecting the lubrication of the journals of railway carriages and locomotive engines, while the same are in motion, by causing a spring fixed in the lubricating chamber or grease box of the axle box (which spring receives a vibratory motion from the shaking of the carriages when in motion) to convey by contract a small quantity of the lubricating fluid to a capillary thread, which thread conducts the fluid thus imparted to it to the journal below by passing down a small tube fixed in the bottom of the lubricating chamber or "grease box," and rising above the level of the lubricating fluid. To prevent the fluid splashing about, and to preserve a regular and even surface of the same, the inventor divides up the lubricating chamber into cells, by perforated partitions, in one of which cells he fixes the aforesaid capillary thread, conducting tube, and spring, or the vibrating end of the spring. *Patent abandoned.*

840. R. GRIFFITHS. *Improvements in weapons of warfare for naval purposes.* Dated March 26, 1862.

This consists in the application to vessels of war of an apparatus which may be put in motion from the interior of the vessel by steam or other motive power, so as to force out a sliding bolt or bolts against the bottom sides, or other part of an enemy's vessel, so as to punch or pierce holes therein below the water line, or elsewhere, if desired. *Patent abandoned.*

841. W. L. WINANS. *A new or improved mode of mounting and apparatus for manœuvring ordnance in land fortifications.* Dated March 27, 1862.

This consists in mounting the gun or other piece of ordnance, together with its carriage, on a platform, which is capable of being raised and lowered by steam or other power. This platform will be mounted on an under framework, on which the platform (with the gun thereon if required) will be made to traverse on a pivot, so that the gun, &c., may be turned round in any direction. *Patent completed.*

842. A. V. NEWTON. *An improved process of and apparatus for separating the fibres of wool, flax, hemp, and other vegetable substances, and extracting the colouring matters therefrom.* (A communication.) Dated March 27, 1862.

This consists in effecting the separation of the fibres of such substances by whipping, beating, rubbing, grinding, or pricking them while they are exposed to the action of water. Also in the washing out of the colouring matters and gums, and other soluble parts from such substances, by changing the water while the said substances are being whipped, beaten, rubbed, ground, or pricked, and while they are at the same time subjected to the action of water. The separated and bleached fibre thus obtained is applicable as paper stock, or in the manufacture of textile fabrics, according to its nature. *Patent completed.*

843. J. HAWORTH. *An improved method of conveying telegraphic messages and signals by means of electricity without the intervention of any continuous artificial conductor.* Dated March 27, 1862.

This invention is not described apart from the drawings. *Patent completed.*

844. W. GREENWAY. *Improvements in the manufacture of bolts for fastening doors, and for other like purposes.* Dated March 27, 1862.

This invention is not described apart from the drawings. *Patent completed.*

845. J. D. SCHNEITER. *An improved method for printing the letters, numbers, musical, or other similar characters, of maps, plans, sheets of music paper, or other similar impressions, the said method being also applicable to the preserving of printing surfaces.* Dated May 27, 1862.

By means of transfer, or other suitable ink, and typographic, lithographic, or other printing, the inventor produces on suitable lines, on very thin sheets of metal, or other suitable leaves or thin sheets, series of alphabets, or other characters or signs made use of in printing, after which these printed leaves may be etched and gummed in the usual way in lithographic printing, and be kept in store till required for use. Any one or more of the inked letters or characters may be cut off from the leaves and serve as movable leaf metal type for composing with words or other suitable compositions, for which purpose the said leaf metal types are glued or otherwise made to adhere firmly with their back to a lithographic stone, or sheet of metal, or other suitable surface, so as to allow of impressions being taken from the said thin type at once on paper, or taking a transfer thereof on lithographic stone, sheet metal, or other suitable printing surface. Or, by pressing, casting, galvanoplastic, or other suitable means, a sort of mould may be obtained, either from the plate with which the letters or other characters were printed on to the thin metal leaf, or from the movable leaf metal types, from which mould an impression may be made on leaf metal, to be used in the manner above explained. *Patent abandoned.*

PROVISIONAL PROTECTIONS.

Dated July 12, 1862.

2012. T. Bateman, Low Moor, Bradford, card manufacturer. Improvements in the manufacture of "card cloth" used for carding wool and other fibrous substances.

Dated July 28, 1862.

2127. J. Walton, 335, Strand, Turkish bath builder, and J. Moore, 11, Upper Berkeley-street, Portman-square, veterinary surgeon. Improvements in the mode of ventilating and heating rooms, Turkish baths, hothouses, and buildings of all kinds.

Dated September 11, 1862.

2503. C. Hoyau, 4, South-street, Finsbury, watch maker. An improved portable apparatus for marking time.

Dated September 15, 1862.

2531. J. Pender, Manchester, merchant. Improvements in hoops for fastening bales, and in machinery or apparatus for making the same.

Dated September 16, 1862.

2540. G. L. Lee, Holborn Hill, lithographic artist. Manufacture of metallic shutters.

Dated September 17, 1862.

2548. S. C. Keeler, 29, Percy-street, Tottenham-court-road. Improvements in veneer-cutting machinery. (A communication.)

2554. G. Haseltine, Fleet-street, American barrister-at-law. Improvements in apparatus for the manufacture of gas from petroleum oil and water, and from cannel coals, bituminous coals, schists, tar, crude coal oil, or other hydro-carbons and water. (A communication.)

Dated September 18, 1862.

2557. P. H. Whitehead, Rawtenstall, Lancaster, manufacturer. An improved support or stand for casks, barrels, or other similar vessels.

2559. W. Todd, Heywood, spinner and manufacturer, and J. Todd, engineer. Improvements in machinery or apparatus for "collecting waste or fly" from spinning machinery, whether for cotton or any other fibrous material.

2561. G. S. Moore, Sunderland, ship builder. Improvements in ship building.

Dated September 19, 1862.

2563. T. Watts, Carisbrooke, Isle of Wight. Improvements in combined thrashing machines.

2565. W. Glass, 37, Princes-street, Stamford-street. Improvements in the treatment of sulphuret of antimony, and in obtaining products therefrom.

2566. E. de la Bastida, 43, Hart-street, Bloomsbury-square. An improved cover for chimneys, adapted to prevent them from smoking, and to facilitate the extinguishing of fires therein. (A communication.)

2569. J. Bouvet, La Rochelle, France, tinman. An improved mode of closing or sealing tin preserve boxes.

2573. W. M. Cochrane, Clattern Cottage, Kingston-on-Thames. Improvements in securing the bolts and nuts of railway fish plates.

2575. R. R. Jackson, cotton manufacturer, and J. Coupe weaving manager, Blackburn. Improvements in looms for weaving.

2577. G. Maw, Benthall Works, near Broseley, Salop, manufacturer. Improvements in the manufacture of tesseræ and other mosaic inlays.

Dated September 20, 1862.

2579. P. L. Forestier, Paris, fancy paper maker. Improvements in photographic albums.

2582. L. Dixey, 21, Kings-road, Brighton, optician, and G. Smith, Angmering, artist. A new or improved method of tinting by lithographic printing, photographic portraits and backgrounds, and embossing the same.

2583. J. Wilson, North Brixton, warehouseman. An improved composition for preventing and removing incrustations in boilers.

Dated September 22, 1862.

2585. C. Mertens, Jubilee-place, Chelsea. Improvements in machinery or apparatus for scutching and dressing flax, hemp, or other fibrous materials.

2589. W. McIntyre Cranston, 58, King William-street. Improvements in machinery for reaping and mowing corn and other crops.

Dated September 23, 1862.

2592. R. Fairnburn, Burley, near Otley, York, manager. Improvements in machines for combing wool or other fibrous substances.

2593. T. Knowles, J. Houghton, W. Knowles, and W. Houghton, Gomersal, York, machine makers. Improvements in looms for weaving.

2594. C. Pontifex, 154, Saint Paul's-road, Canonbury. Improvements in means or apparatus for removing or expressing beer from yeast or from hops.

2595. W. Dobson, Nottingham, lace dresser. A new method of producing various colours on lace or other fabrics.

2596. J. J. N. Micas, Chateau de By, commune de Thomery (Seine et Marne), France. An improved railway brake.

2597. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in lighting apparatus. (A communication.)

2598. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in photographic apparatus. (A communication.)

2599. S. H. Laurent, 29, Boulevart St. Martin, Paris. An improved railway brake.

Dated September 24, 1862.

2601. J. Farran, Manchester-road, Bolton-le-Moors, manager. Certain improvements in looms for weaving.

2603. W. Taylor, Chester. Improvements in blacking or polish.

2604. R. A. Brooman, 166, Fleet-street, patent agent. An improved composition for painting. (A communication.)

2605. W. Maddick, Liverpool, garancine manufacturer. An improved process or method of treating and preparing madder for dyeing purposes.

2606. D. Posener and A. Posener, Rupert-street, Haymarket. Improvements in the manufacture of india-rubber and other tobacco pouches or purses.

2607. R. R. Jackson and Æ. I. Jackson, Blackburn, Lancaster, cotton spinners and manufacturers. Improvements in the preparation and treatment of flax and other fibrous materials to be subsequently acted upon by machinery employed for preparing and spinning cotton.

2608. R. R. Jackson and Æ. I. Jackson, Blackburn, cotton spinners and manufacturers. Improvements in machinery for cutting fibrous and other materials.

2609. W. Upfill, Birmingham, iron merchant and manufacturer, and W. Asbury, engineer. Improvements in the manufacture of metallic bedsteads, part of which improvements are also applicable for ornamenting tubes and curtain and cornice poles.

2610. T. Edwards, Blackheath, gentleman. An improved mode of preparing fibrous materials for spinning.

Dated September 25, 1862.

2613. T. Kennedy, Kilmarnock, water meter manufacturer. Improvements in taps or valves.

2615. J. Raywood, Sheffield. Certain improvements in the construction of gas apparatus for the prevention of fraud, and for economizing the consumption of gas.

2616. J. R. Breach and E. B. Pyesmith, Leeds, manufacturers. An improved machine for reducing or equalizing the length of animal or vegetable fibres.

2617. J. Eardley, Woodville, Leicester. Improvements in pitch pipes or tuning pipes.

2618. W. Lea, Wolverhampton, manufacturer. Improvements in hinges for French casements.

2619. A. Potter, Birmingham. Improvements in electro-magnetic engines.

2620. P. Wright, Dudley, manufacturer. Improvements in the manufacture of parallel vices.

2621. J. R. C. Taunton, Birmingham, manufacturer. Improvements in the manufacture of metallic bedsteads, cots, and couches.

2622. E. G. Muntz, Birmingham, manufacturer. An improvement or improvements in the manufacture of axles.

2623. T. R. Harding, Leeds, hackle pin manufacturer. Improvements in machinery for opening, cleansing, and carding fibrous material.

Dated September 26, 1862.

2625. J. J. Bates, Birmingham, architect and surveyor. A new or improved window sash fastener and guard.

2626. E. Dixon, Wolverhampton, manufacturer. Improvements in machinery and furnaces used in the manufacture of welded iron tubes.

2627. C. D. Abel, 20, Southampton-buildings, Chancery-lane. A new or improved purifying or preservative lotion for the mouth. (A communication.)

2628. J. Milner, R. D. Milner, and F. Hurd, Wakefield, machinists and co-partners. Preparing fibrous substances.

2630. W. M. Cochrane, Clattern Cottage, Kingston-on-Thames. Improvements in securing the bolts and nuts of railway fish plates.

Dated September 27, 1862.

2631. F. R. Stack, Whetstone. Improvements in escalading apparatus for military purposes.

2632. J. Crosby, Shepley Hall, Audenshaw, near Manchester, flax spinner. Improvements in carding engines.

2633. H. Hutchinson, 26, Rue Notre Dame des Victoires, Paris, merchant. Improvements in machinery for covering wire with india rubber and gutta percha, and similar gums and compounds thereof, and for manufacturing tubes and other articles of such gums and compounds. (A communication.)

Dated September 29, 1862.

2635. J. C. P. Bauchard, Nouvion en Thérache, L'Aisne, France, miller and baker. A twice-transversal kneading trough.

2636. H. Baum, Elberfeld, Prussia, manufacturer. Improvements in the manufacture of moreens and such like fabrics.

2637. J. Brown, Middleton, Lancaster, machinist. Certain improvements in carding engines employed for carding cotton and other fibrous substances.

2639. M. Puddefoot, Blisset-street, Greenwich, hat manufacturer. Improvements in apparatus for tilling land.

2640. W. B. Lord, Sandgate, veterinary surgeon, Royal Artillery, and F. H. Gilburt, gentleman. Improvements in loading firearms, and in blasting.

2641. W. E. Gedge, 11, Wellington-street, Strand. An improved furnace for casting steel. (A communication.)

2643. H. Hirsch, 65, Bridge-road, Lambeth. Improvements in apparatus for showing combinations of colours.

2644. The Rev. H. Moule, Fordington Vicarage, Dorchester. Heating frames and the beds of hot houses.

2645. H. Ellis, Bangor, North Wales. Improvements in the manufacture of compounds of silica, and in the application of certain compounds of silica to mineralize woven fabrics, paper, and paper pulp, to harden and preserve stone and cement in the production of artificial stone and paint, and in the production and glazing of porcelain and such like manufactures.

2646. J. Bucknall, Boston, Lincoln, mechanic. Improvements in the construction of horse shoes.

2647. J. Addison, St. Heliers, Jersey, captain. Improvements in moorings or apparatus for securing articles, applicable also to the fixing of chairs for railways.

2648. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in saddle trees and collars. (A communication.)

2649. J. H. Johnson, 47, Lincoln's-inn-fields, gentleman. Improvements in shells for war purposes. (A communication.)

2650. W. Carrick, and William Carrick, jun., Carlisle, hat manufacturers. Improvements in felting apparatus.

Dated September 30, 1862.

2652. E. J. M. Le Bréton, Neuilly-sur-Seine, near Paris, gentleman. An improved propeller for boats and ships.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

1637. A. Gilbey. Packing cases.

1639. G. Ermen and R. Smith. Fibrous materials.

1659. C. H. Roeckner. Constructing coffer dams.

1671. W. H. Hall. Safety lamps.

1674. S. Weston. Trusses.

1676. J. Fincham. Facilitating the repairing of roads and ways.

1680. W. James. Bolts, spikes, and nails.

1681. T. Allcock. Horse rakes.

1683. G. Allibon and E. Snell. Surface condensers and superheaters.

1684. G. B. Toselli. Mixing syrups.

1688. E. Scheutz. Rototary engines.

1695. R. Robinson. Fire-escapes.

1696. J. M. Stanley and J. Stanley. Diffusing heat.

1703. W. E. Newton. Construction of organs and other wind instruments. A communication.

1710. A. J. Adams. Riding fire-arms.

1711. G. D. Hatton. Presses.

1718. J. Keeling. Manufacture of gas.

1723. A. Knowles. Washing extracted wool and other fibre.

1729. G. T. Jourdain. Treating cocoa-nut oil.

1730. H. C. Jennings. Preparation of skins.

1739. W. Crook. Looms.

1743. B. W. Gerland. Manufacture of sulphate of copper.

1745. J. Hetherington. Lubricating revolving surfaces.

1747. I. Spight. Horse shoes.

1749. A. A. Lerenard. Improved cement.

1754. M. Jackson. Improved shield.

1760. C. A. Tyler. Improved holder for holding dinner and other plates.

1766. J. Robinson. Machinery or apparatus for sawing wood.

1769. J. Sawyer. Steam boiler and other furnances.

1790. J. Nield and T. A. Nield. Moulding or manufacturing pipes.

1794. W. Clark. Manufacture of buttons.

1796. J. Kellow and H. Short. Blasting powder.

1818. J. Bedford. Irons and cutters of planes.

1834. S. Holman. Pumps and valves.

1913. T. Parker. Tinting or dyeing fabrics composed of mixed animal and vegetable fibres.

1924. E. de Labastida. Manufacturing india-rubber articles. A communication.

2051. J. Willcock. Ornamental fabric. A communication.

2255. L. Serbat. Lubricating machinery.

2367. L. Jarosson. Machinery for bleaching or washing textile fabrics and materials.

2565. W. Glass. Treatment of sulphuret of antimony.

2621. J. R. C. Taunton. Manufacture of metallic bedsteads.

2623. T. R. Harding. Machinery for opening, cleansing, and carding fibrous material.

2627. C. D. Abel. Purifying and preservative lotion. A communication.

2656. G. Haseltine. Warming and ventilating buildings. A communication.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

Dated October 1, 1862.

2656. G. Haseltine, 100, Fleet-street. Improvements in the means for and mode of warming and ventilating buildings. (A communication.)

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2271. G. A. Smith.
2443. W. Clark.
2331. T. Twells.
2334. W. Prosser.
2320. J. Carrick.
2343. G. Price.
2336. W. Burgess.
2316. J. Skertchly.
2338. T. Vicars, T. Vicars, T. Ashmore, and J. Smith.
2345. J. Jack.
2367. W. E. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2243. W. Rothera.
2317. H. Bessemer.
2319. H. Bessemer.
2321. H. Bessemer.
2325. H. Bessemer.
2327. H. Bessemer.
2309. W. Cotton.
2553. J. Wilkinson.

LIST OF SEALED PATENTS.

1048. E. Butterworth.
1052. J. Howard, T. Bousfield and T. Phillips.
1053. I. Whitesmith.
1055. N. Nussey.
1058. E. Drewett.
1062. E. Paton and W. Batho.
1063. J. F. Spencer.
1075. R. A. Brooman.
1076. R. A. Brooman.
1080. T. H. Bennett.
1081. F. A. Le Mat and C. F. Girard.
1086. J. Platt and W. Cheetham.
1087. J. Platt and W. Richardson.
1090. T. W. Gray.
1091. F. C. Philippson.
1096. T. Edwards and J. Harrison.
1097. J. Barbour.
1100. D. Stott.
1110. J. H. Johnson.
1120. W. Harling, J. M. Todd, and T. Harling.
1122. J. Murphy.
1125. J. L. Perin.
1128. R. A. Brooman.
1132. S. Rideal and R. Shepherd.
1133. W. Clark.
1134. J. C. Rivett and J. M. Hetherington.
1135. R. Wedgwood.
1138. J. S. Phillips.
1145. E. Loysel.
1148. A. N. Wornum.
1150. H. Lumley.
1168. S. S. Putnam.
1171. A. Warner.
1174. R. Boby.
1179. G. H. Birkbeck.
1192. W. Haggett.
1193. H. Wheatley.
1194. J. Bond.
1204. R. Zimara.
1230. W. Clark.
1235. G. Bischof.
1268. G. Davies.
1295. R. Walker.
1333. F. Marrel.
1506. F. E. Sickels.
1529. H. B. Barlow.
1833. J. Anderton.
1874. G. Peterson.
2007. T. Hill.
2230. G. Haseltine.

LIST OF SPECIFICATIONS PUBLISHED

For the Week ending October 11, 1862.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s. d.		s. d.		s. d.		s. d.		s. d.		s. d
553	0 4	564	0 4	575	0 4	587	1 8	599	1 4	610	0 4
554	0 10	565	1 2	576	0 10	588	0 4	600	0 4	611	0 4
555	0 8	566	0 10	577	0 4	589	0 4	601	0 10	612	2 0
556	0 4	567	0 8	578	0 4	590	2 6	602	0 6	613	0 10
557	0 10	568	0 4	579	0 8	591	0 8	603	0 8	614	0 6
558	0 4	569	0 4	580	0 4	592	0 10	604	0 10	615	0 4
559	0 10	570	0 10	581	0 4	593	0 4	605	0 4	616	0 10
560	0 4	571	0 10	582	1 4	594	1 2	606	0 6	617	0 8
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563	0 10	574	0 4	585	0 4	597	0 4	609	0 4	620	0 4
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Note.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, OCTOBER 24, 1862.

THE MACHINE-TOOL SUBSTITUTES FOR THE FILE IN THE INTERNATIONAL EXHIBITION.

Mr. Fairbairn remarked the other day at Cambridge in the course of his address to section G of the British Association, alluding to the International Exhibition, "that he did not believe "that at any former period there had been "such an exhibition of machines and of tools, "which are the creators and makers of the "machines themselves. Some of the tools, "such as the turning, boring, planing, and "slotting machines, are of a very high order, "and the tool machinery for the manufacture "of fire-arms, shells, rockets, &c., is of such "a character as to render the whole opera- "tions, however minute, perfectly automaton "or self-acting, with an accuracy of repeti- "tion that leaves the article when finished "identical with every other article from the "same machine. Such, in fact, is the per- "fection of the tool system, as it now exists, "that in almost every case we may calculate "on a degree of exactitude that admits of no "deviation beyond a thousandth part of an "inch."

Such a comment from the Nestor of engineering would be sufficient to justify more notice than we have space for on this subject, even if it were not of the importance that it undoubtedly possesses.

The designing of machine-tools is certainly the most important branch of practical mechanics, as upon it depend the quantity, and to a great extent the quality also, of all other machines; and it is probable that every advance in this direction is followed by a proportionate extention in the use of machinery. There is no doubt that one of the principal means by which English manufacturers keep ahead of the cheap labour of the continent is by their machine-tools. An English fitter gets just about double the wages in cash that the French and Belgian "ajusteur" or the German "schosser" receive per day. How foolish and suicidal therefore is the smouldering jealousy as to the extension of machine-tools that we have often noticed amongst English operative engineers. This feeling is certainly diminishing, but it still exists to some extent, as we have witnessed. The use of machinery in most arts has the effect of requiring more intelligence in those working it than is wanted in hand labour. No doubt there is less demand for certain kinds of skill; there is less hard chipping and filing, but there is more erecting to be done. There has been a kind of complaint that there is nothing very original in this department, amongst others, of the mechanical exhibition. We have no doubt that if the Americans had fully exhibited they would have shown us several new notions in this line. It would be too long a digression to examine into all the reasons of this being a very probable case, but apart from such causes as the dear labour and cheap education in America, and also the excellent patent law of the States, there does not appear to be in the New World that horror of novelty, because it is new, as there is with us. Busy, bustling ignorance will often achieve more than quiescent science, and the history of human knowledge is a history of tentative experiments. We make these allusions because we really believe that our tool makers generally are too conservative, and too much given to copying each other. There are no doubt many things that might be tried. For instance, the the practicable application of any harder and tougher material than steel, let us say, Rhodium, giving a harder and tougher working edge to the cutting tool, would effect a great revolution in working cold iron, by allowing the tools to travel at a greater speed, and to take a heavier cut than at present. Of course we are well aware that all machine-tools are more or less substitutes for the chisel and file. For instance, even the moulding machines introduced into all large shops having a repetition of work, do away with much fitting, from the castings therefrom being much more accurate than those produced by hand. (We intend to describe these latter more in detail in a future number. There is, however, a class of tools which can more especially be called filing machines. These are, the shaping machine with a reciprocating tool, the shaping machine with revolving cutters, and lastly, the various new kinds of emery-wheels for grinding and polishing, introduced of late years, to meet new requirements. . . . Most practical mechanics visiting the Exhibition, will have observed that the details of Whitworth's machines in the western annexe are not at all touched by the file. For instance, in his shaping machines, the handles, links, ratchets, eyes of rods, &c., are merely shaped out and case-hardened. The furrows left by the tool are pretty plainly perceptible; but the surfaces look neater to our eye than those in the marine engine of Humphreys and Tennant, close by. The latter are certainly drawfiled, but the file scratches and "pin" marks are very plainly seen. Mr. Humphrys, who is said to be "pleasantly" strict with his men, seems for once to have been a little lax. This machine-tool is euphoniously styled the "jigging" machine in the Lancashire shops; we presume from its lively appearance in working to and fro. Mr. Naysmith, of Patricroft, has the name of having first brought it out, and it, no doubt, helped to "jig" him into a fortune. The French call it a "limeuse" or filing machine. Most of these machines in the Exhibition are upon the same plan, the work being stationary, while the tool is moved along in a travelling head, worked by a ratchet motion and screw, the tool and work being reciprocally moved on what might be called the method of double ordinates. Most of the larger-sized ones have a quick return motion, to gain time in the back stroke. It is a noticeable thing that in almost all Mr. Whitworth's machines with a reciprocating action, from his largest planing down to his smallest shaping machines, there is always some contrivance or other for saving time in the return movement.

A miniature shaping, or rather slotting machine, for nuts and bolt-heads, by Hartmann, of Chemnitz, in Saxony, has attracted some attention. We believe it to be patented in England. It has a double frame with two slides, each one cutting vertically the opposite faces of the same nut at the same time. The nut is fixed on a vertical spindle, with detent revolving motion. The machine is of rather slim proportions to an English eye. We believe that the price of this machine is about £90.

We remember to have seen in the extremely well-managed shops of Messrs. Clayton and Shuttleworth, of Lincoln, the eminent agricultural engineers, an excellent and original little tool of their own make. They use it principally for shaping the brass eccentric straps of the innumerable portable engines they send to all parts of the world. It consists essentially of a kind of rough file, with teeth shaped somewhat like those of a circular cutter, and worked up and down in a species of small slotting machine. The eccentric straps or other details are traversed underneath on a table. It seemed to do its work very quickly and neatly. This machine may be said to form a connecting link between the reciprocating and circular-cutter shaping machine.

It appears to be a general problem in practical mechanics to substitute in all machines, when possible, a continuous circular motion for the rectilinear reciprocating movement. The history of the steam-engine, of the steam printing press, of the iron manufacture, &c., are examples of this. The economy of time by a continuous action, and of "vis viva" in the avoidance of shocks, are the objects sought to be attained.

The lathe is the perfection of a machine-tool, both as to quality and quantity of work done. No time is lost in the return of the tool; a higher speed is allowable from there being no blow or impact, and from these reasons again, a smoother surface is obtained. It gives much cheaper work, surface for surface, and sum for sum of molecular forces overcome, as compared with reciprocating tools, although with the lathe a highly-paid operative is employed, and as compared with the circular shaping machine from its allowing a heavier cut to be taken.

The circular, or rose-cutter, is called a "fraise" in French, the same word being used by them to designate the peculiar collars or ruffs, very similar in outward appearance to this tool, worn in the reigns of Good Queen Bess and James I.; and in which the former is always pourtrayed. The advantages of the circular cutter are, amongst others, continuous action, and the cheapness of the structure required for developing the same. Its counterbalancing disadvantages are the expense and risk in manufacture—it being so subject to spring in the tempering—the difficulty in sharpening it, and its want of adaptability to varying work. The spindle on which it is fixed is also liable to vibrations if not well secured at both ends. This jarring action would be diminished if the teeth were made at an angle to the axis; but then the manufacture would be a rather more expensive job. The circular form, also, does not permit of the cutting edges being of a strong shape, so that the cut to be taken is rather limited in depth. If a larger diameter of cutter be used, most of the other difficulties increase in the same ratio.

It has sometimes occurred to us that an inexpensive and effective rose-cutter might be made in the same way as Biddell's patent cutters used in the oat mills sold by Ransomes and Sims, of Ipswich. The specification, No. 1,355, year 1855, does not specify cutting in metals. Steel cutters are fixed in a cast-iron disc by placing them in the sand and casting the metal round the inside ends. The spokes of locomotive wheels used to be fixed in this way. It is still in use for railway carriages and portable engine wheels. The spokes of the pulleys for mining hoists, and the blades of some kinds of turbines are united to the bosses on this plan, only inferior in solidity to a wrought-iron forging. The whole is then tempered in water or oil when at a red heat, and the result is a steel edge with a tough iron back. The edges might be kept sharp on a grinding machine with narrow stones, like the one of the Messrs. Robinson, in the Western Annex, with the addition to it of a slide rest. We also do not see why a broad cutter should not be built up out of several narrower ones. With all its defects this kind of shaping machine is in extensive

use, not merely for nuts and bolt-heads, but for grooving screw-tops, cutting out forked joints, and grooves generally, &c. It is more especially adapted for a repetition of work, and is therefore more useful in a locomotive shop than in one for making stationary engines. It is also very extensively used by the gun-makers. Two of the most original and ingenious machines of this class are shown by Greenwood and Batley. One, which they call the edge or profile-milling machine, to copy irregular figures, is especially useful. It consists of a bed, with a cross piece carrying a transverse slide over the movable table which supports the work. Upon the transverse slide is fitted a vertical slide which carries the spindle with its cutter. Both these slides are free to move by means of a hand-lever which passes into a universal joint. The table upon which the work is placed is also free to move longitudinally by hand motion. Upon the vertical slide, parallel with the spindle, is placed a steel tracer, of the same size as the cutter. The work to be cut is fastened upon the table, and by its side is fixed a steel copy of the form required to be produced. The machine is put in motion (the spindle being driven by a strap passing round a long wooden drum driven at back of machine and through a space on the slides), and the steel tracer is held by means of the hand-lever in contact with the copy, and at the same time the table is moved by the other hand of the operative, so as to traverse the length of the article to be cut. By the action of these slides all the intricacies of the shape of the copy are followed by the tracer, and the cutting tool shapes the work to the exact form of the copy. Sock plates, hammers, butt plates, trigger guards, and many other parts of the rifle are shaped in this machine, and it would no doubt be very useful for many jobs in any engineering shop.

The second machine of the kind at this most interesting stand is termed by the makers "the straight milling machine." In this machine the spindle is driven by a wheel and pinion, the teeth of which are cut diagonally, or more correctly speaking, the teeth of the wheel and pinion form two screws of as many threads as teeth, and working into each other. The object of this form of tooth is to prevent any back lash, and to produce smoothness of work. The table cannot be altered vertically, but the journals of the spindles are made to adjust up and down by screws. The spindle is held endways by means of hardened cast-steel collars, which are carefully ground. This machine has a self-acting table, with an apparatus to instantly stop the machine when the work is finished cutting. The cutters are made to the form required on the surface of the work, and ground up in their places on an arbor, being mounted on the driven spindle, and the end of arbor carried by a loose head which is adjusted to the same height as the main spindle. This machine, with suitable fixings, is said to perform nearly one-fourth part of all the shaping required for the rifle. A great number are being used in Birmingham.

Whitworth, of Manchester, Smith, Beacock, and Tannett, of Leeds, also exhibit in this line.

Fairbairn & Co., of Leeds, show a neat little "pentagraph cutting machine" for toothing turned-up circular cutters, by means of another small revolving cutter, moved on the pentagraph principle.

We now come to our third classification of machine-tool substitutes for the file; that of grinding and polishing machines. The grindstone has always been used in engineering shops for rough work—particularly for cotton machinery — such as taking the skin off cast and wrought iron previously to polishing it up by the "glazer." There is a limit to the speed of the stone, as it is apt to fly to pieces by the centrifugal force. We believe that the Journeymen Grinders' Society require the speed of stone not to exceed 2,800 ft. per minute. We have seen a man killed in this way. The stone broke in laminæ at right angles to the axis of spindle. The "glazer" being merely a piece of leather on a pulley, on which the emery or corundum is glued, is also not very durable. Of late years, in consequence of chilled cast-iron and case-hardened wrought-iron surfaces being more extensively used, it has been found necessary to use grinding talles to take out the irregularities of surfaces caused by these hardening processes. As remarked by Professor Rankine, in the Jurors' Reports: "With respect to material, the most striking improvements since the 1851 Great Exhibition, are those which consist in the greatly extended use of steel, and of iron approaching to steel in its properties." We remember to have seen, about two years ago, in the well-known Atlas Works, Manchester, a machine for polishing their steel or case-hardened slidebars, &c. It consisted of two stones or emery rollers, placed in lieu of the tool-boxes on an ordinary planing machine. The emery rollers were discs about 12 in. in diameter and 2 in. broad, and were formed of gun-metal rings 2 in. thick, shrunk on a roller. Oblique grooves are cut into the rings, and the whole is covered up with a small splasher to somewhat prevent the oil and emery, which are fed on the work, from flying off. These rings are said to last about three months in constant wear.

Another form of this machine in those works was a disc some three feet in diameter, revolving horizontally, and on which the work was pressed, while in the former arrangement the rollers were lowered by the tool-slide. Similar machines are in use in the Gorton foundry, near Manchester. The horizontal disc is also found very useful in taking the scale off brasswork. In a cursory way, we alluded last week to a trial in the western annex of Warne and Co's newly-patented emery wheels. One kind of these is formed from a mixture of india-rubber and emery, in which shape it has been long used in the States. Warne and Co., however, have lately employed the remarkable new material called oxydized oil, introduced by the firm of Walton and Co., of Chiswick, for consolidating the emery. This substance is intended as a cheaper, and is, no doubt, in many cases a superior, substitute to india-rubber. The travelling surface of the wheel shown in the western annexe was about 6,000 feet per minute, which is about the speed of Messrs. Hunt and Roskell's diamond-polishing wheels, in the same place.

By the courtesy of Mr. W. Adams, of the North London Railway Works, Bow, where they have been used for some time, we were enabled to see the wheels in practical operation. A row of five of them were placed on a spindle in the same manner as other grinding-wheels. The largest was about 18 inches in diameter. They revolved slower than the one in the Exhibition. We saw them used for fitting in the keys of wheels, and the cottars of connecting rods. It was stated that these jobs could be done by them four times quicker than in the usual way. The same company use them for "getting up" spanners, polishing steel slide-bars, &c. The whole operation is very clean, no oil or water being required. The great speed that it is possible to apply to these wheels gives them great power of abrasion. The discs revolve from the operatives, whose hands, therefore, cannot be drawn in. The writer of this notice nearly lost his hand in an ordinary grindstone in this way, some years ago, so that he fully appreciates this advantage. So pleased is Mr. Adams with this system that we believe he is making a machine to use wheels made up with a finer No. of emery for "drawfiling" surfaces.

There is also a machine with similar wheels for sharpening circular saws, at these works. From the ingenuity of the idea of this machine, and the want of sound sense in the way it is carried out, we should think it is French, An emery wheel is caused to just abrade the tip of the tooth. We do not see how these wheels can be made to grind up chisels, as the temper must evidently be lowered in the process.

Pursch, of Dresden, also exhibits small emery wheels, but we do not know what material he uses to consolidate the emery. Altogether we feel convinced that these emery wheels, and generally tools of this kind, have "a great future before them," as our French neighbours say. Emery, a mixed granular corundum ore, is only inferior in hardness to the diamond; can be had of any fineness, and brought to bear in this way safely and cheaply, can be put to a very great variety of uses in any well-conducted engineer's workshop.

There are some more machines of the kind we have now slightly treated on in the Exhition catalogue; to quote the words of the Jury, "we have carefully searched for, but not found them." A contemporary has been more fortunate, as we have seen some interesting criticisms on things which have given rise to the above pathetic complaint expressed with so much "naïveté" by the very learned Jurors.

H.

HYDRAULIC MACHINES AT THE INTERNATIONAL EXHIBITION.

The water-wheel in this country once played an important part, but as the stage-coach has disappeared in presence of the locomotive, so has the hydraulic prime mover yielded its ground to the stationary steam-engine. Water, however, though not frequently used for the purpose of communicating motion to the overshot, the undershot, or the breast-wheel, and through them to long lines of shafting and to machinery in connection with that shafting, is yet pressed largely into the service of the mechanic. In the hydraulic press, for example, we see a marvellous proof of the force which it may be made to exert; and the variety of purposes to which that force may be applied we need not tell our readers.

In the form of a combined steam and hydraulic apparatus, a very excellent specimen occurs in the Western Annex, and for the production of which we are glad to see a prize medal has been awarded by the jurors. This is the production of Mr. F. O. Ward, of Hertford-street, Mayfair, London, and is called a Patent Improved Hydraulic Pumping Engine. The engine is on the horizontal principle, and the four powerful pumps attached to and driven by it are also horizontally disposed. The latter are placed on the sides of an elongated hollow bed of cast iron, which serves to support the cylinder and guide blocks of the engine, and also as a cistern. The pumps are of a peculiar construction, and their arrangement admits of their being made longer than is usual in ordinary hydraulic pumps. The four pumps are coupled together in pairs, if it be not considered a Hibernianism to say so, and the plungers of each pair are attached to the opposite ends of an intervening slide. The slide is moved to and fro between horizontal guides by the end of a connecting rod whose

opposite extremity is impelled by the crank of a driving shaft transversely disposed across the oblique end of the cistern. The peculiar grouping of the parts upon and around the cistern is such, therefore, as to compress two machines within the area usually occupied by one. To this advantage of compactness of form, that of lightness is added, since the same casting which serves as a bed-plate for the engine also serves as a stiff framing for the pumps. It has been stated that the same casting forms a water cistern for the supply of the pumps, and it thus is really made to perform three important offices.

There can be no question about the economy and efficiency of the Improved Hydraulic Pumping Machine. There it rests like a giant in repose, but the strength and symmetry of whose limbs betoken his might when roused to action. In the internal fittings of this apparatus there are some peculiarities which demand attention, and which seem to us to make it perfect in its way. The pumps have their inlet and outlet valves both placed at one end, instead of having them, as is usual, placed at opposite ends of the barrel. The water, therefore, enters and leaves the pump at the same end, so that the annular waterway, necessary in the last case to be formed between the plunger and the barrel, is not in this required at all. The plunger is accordingly turned to fit the barrel, and no cavity remains to harbour air, so detrimental to the vacuum and suction power of the pump. The back-slip, or reflux of water through the valves during their fall, must palpably be less than in the ordinary contrivances of a like character, because the valves are less numerous, in the proportion of one to three. In fact, it does seem to us that in the designing of this apparatus Mr. Ward has presented a very strong claim to the admiration of the hydraulic engineer, and proved himself to understand practically the exigencies of the peculiar work for which that apparatus is designed. It is scarcely necessary to say that the Hydraulic Pumping Engine is intended for working hydraulic presses. With some slight modifications it might, nevertheless, be made available for other kinds of pumping work. Messrs. Wren and Hopkinson, of Manchester, are the manufacturers, under Mr. Ward's patent, and from them, therefore, the apparatus may be ordered and obtained.

Messrs. Peel, Williams, and Peel, of Soho Iron Works, Manchester, have earned for themselves a high reputation in the department of hydraulic machinery, and a press is exhibited by them in the Western Annex, which is worthy of notice. The cylinder in this case is 12 in. in diameter, and the press is calculated to be made to exert, with safety, a pressure equal to 340 tons. This is allowing the force of water-pressure to be equal to three tons on the square inch. Considering the power of Messrs. Peel and Co.'s press it has a very light appearance. The columns supporting the top are of wrought iron turned bright from end to end. The recesses upon which the collars of the columns rest are planed true to one surface, so as to ensure a fair and uniform bearing upon each corner of the framework—a point of much consequence, as an unequal distribution of the force exerted might be fatal to the apparatus. It is also furnished with extra waterways, which expedite the running down of the table. Presses of this kind are used for expressing the syrup or juice from beet-root in the sugar manufactories of Southern Russia; but of course there is an infinity of other purposes to which they may be applied.

A set of hydraulic press pumps are also exhibited by the same firm. These are worked by two independent steam-engines on the new condensing and direct acting principles. There are eight pumps in this case, four being 1¼ in. in diameter, and four 1 in. only, the length of stroke in each case, however, being 3 in.

Usually one of each size is employed for each press, and the arrangement is such, that when a pressure of one ton to the square inch has been reached, a self-acting apparatus causes the larger pump to cease its action, and the maximum pressure is arrived at by the use of the small pump alone. The pumps receive motion from eccentrics fixed upon the crank shaft common to both engines. Suitable safety valves, as well as stop and let-off valves are attached to this set of pumps. The cylinders of the steam-engine are 8 inches in diameter, and the length of the stroke is 16 inches. The speed may be varied from 80 to 100 revolutions per minute.

The whole of the arrangement is a model of compactness, and unusual facilities are afforded for taking apart every portion of the contrivance for repairs or for cleansing purposes. All the joints are metallic, and the minor details have evidently been contrived with a view to obviating the evils which practice has shown to arise in the employment of hydraulic apparatus for similar purposes.

It has been stated that the Exhibition furnishes no specimens of the water-wheels of either of the kinds so well known a few years back. There are, however, to be found therein some very good examples of the substitute for those contrivances, known as the turbine, and though we are not enthusiastic admirers of such motors, it would be improper to pass them by without notice. The most remarkable of these is shown in the form of a model by Williamson Brothers, of the Canal Iron Works, Kendal, Westmoreland. This is in reality a modification of the vortex-wheel, of which Professor Thompson, of Belfast, was the originator, and about which, some years since, a considerable amount of controversy took place. It is so constructed as to receive water at the circumference, and to deliver it at the centre. Principally this form of turbine is used for high falls, and experiments have shown it to possess, relatively with other apparatus of a like kind, several advantages. It may not be improper to allow Professor Thompson himself to speak as to the merits of the vortex-wheel or turbine. No doubt that gentleman, with the natural feelings of an inventor, has advanced as much in its favour as it is possible for any one conscientiously to do, and it will be for others to examine and estimate the value of his evidence. Professor Thompson says, that "there is in these water-wheels a very "remarkable adaptation, according to which "by the balancing of the contrary fluid pres-"sures, due to half the head of water, and "the centrifugal force in the wheel, only one "half of the work due to the fall is spent in "communicating *vis viva* to the water, to be "afterwards taken from it during its passage "through the wheel; the remainder of the "work being communicated through the fluid "pressure to the wheel, without any im-"mediate generation of the *vis viva*." It might be wished that the professor had expressed his meaning here a little more clearly, which by the judicious employment of fewer words he might, we think, have done; but the context makes that meaning more apparent. "By "this important arrangement the velocity of "the water when it moves fastest in the "wheel is very much reduced, and the loss "due to the retarding action of channels, or "passages, which cannot be entirely removed in "any hydraulic machine, is thus diminished to "a great degree. In this characteristic the vortex-"wheels have a superiority over the best "turbines of Fourneyron or Poncelet."

The well-known firm of Donkin and Co., of Grange-road, Bermondsey, exhibit also a turbine which has some peculiarities. It is intended for the reception of a vertical current, and for a very high fall. The advantages which Donkin and Co. claim for this hydraulic machine, are, that a high speed may be directly obtained from it, and economy in wheels, drums, and other gearing thus be ensured; that it is free, when in action, from the inconvenience which is so much felt in time of floods from the use of the ordinary water-wheel, and that under all circumstances its useful effects are greater than can be obtained from the last-named appliance.

The celebrated hydraulic and general engineers, Messrs. Easton and Amos, are well represented at South Kensington as regards the first-named branch of their business, and their turbine, which is on the Fourneyron principle, is adapted for either high or low falls of water. It is claimed for this that it is compact, that its working parts are easily accessible, and that its regulating gate for controlling the quantity of water admitted to it is of a superior kind.

The same firm exhibit also a Patent Combined Appold's Centrifugal Pump and Steam Engine, for drainage of marsh lands, irrigation, &c. This machine is of 40 horse-power nominal, and is driven by a pair of expansive condensing engines. The arrangement of the whole is admirable, but too well known to need at our hands a lengthened description. The pump is capable of lifting 100 tons of water per minute, at a mean lift of six feet. Smaller pumps are shown by the firm in question, on the Appold plan, as are some "Improved Hydraulic Rams" for supplying small towns, mansions, &c., with water, in sites where a small fall exists. As has been observed, the firm of Easton and Amos are well known for their practical skill in the carrying out of hydraulic works generally, and it is probable that few engineers in this kingdom, or indeed in any other, have had so much experience with regard to water-works generally as they have.

Messrs. Fontaine and Brault, of Paris, exhibit a turbine which has its own peculiar characteristics, and is a fair exemplification of French hydraulic machinery. The turbine is indeed largely used in France, and has obtained more favour in all respects among the engineers of that country, than on this side the channel; this, of course, is partly due to circumstances. The steam-engine has not found its way into many of the remote districts of the empire, and the primitive modes of impelling machinery are still therefore resorted to. We have seen some excellent specimens of water-wheels in some parts of France, and those not far from the gay metropolis itself.

One of the French turbines exhibited has, we perceive, been purchased for use at Portsmouth Dockyard.

The Messrs. Lawrence, City Iron Works, Pitfield Street, London, N., exhibit in the South-West Court a series of working models, which to the hydraulic engineer are of considerable interest. The principal of these is illustrative of their patent sluice, in which the pressure of the water is made to lift the sluice. In practice this has been found an eminently successful arrangement, and it may be seen in full operation at the Lavender entrance of the Commercial Docks, Rotherhithe. A diving-bell, with signal apparatus and safety valve for the prevention of accidents, identical with that used by Messrs. H. Lee and Son, in the construction of the Admiralty Pier at Dover, is shown in the form of a model. Other speci-

mens of hydraulic apparatus manufactured by this firm are also to be found in the court named.

We have before had occasion to refer to the hydraulic lift (Clark's Patent) as erected and in successful operation at the Thames Graving Docks, Victoria Docks, but those who desire to see an exact model of the "lift" and its accessories will find it in the South-West Court. In the South Court may be seen models of the iron floating docks of the Messrs. Rennie, to which reference has heretofore been made in these pages. The action of these admirable contrivances depends much on hydraulic apparatus, and we have deemed it prudent, therefore, in our review of the hydraulic appliances of the Exhibition, not to omit mentioning again these extraordinary specimens of engineering skill. The pumps of the Messrs. Gwynne are unquestionably worthy of observation, but those to whom the wondrous capabilities of their contrivances are not sufficiently known must be referred to former numbers of the Mechanics' Magazine.

Messrs Benjamin Fowler and Co., of Whitefriars-street, Fleet-street, exhibit hydraulic rams, force pumps, and fire-engines, all of which show distinctive marks of excellence, and prove that for hydraulic machinery of these kinds, that firm is not far behind, if behind at all, any rivals. Of the Messrs Warner, Lambert, and some other London firms, well known in the hydraulic branches of engineering, we have before had occasion to speak, and that in commendation; we, therefore, pass on to the "exhibits" of Messrs. Tangye Brothers and Price, of Birmingham, and for whom Mr. Holman, of 18, Cannon-street, E.C., is the London agent, and the hydraulic cotton and wool presses of this firm are admirably adapted for their purpose; while the Patent Hydraulic Lifting Jack is at once a novel and very practical adaptation of hydraulic agency to "common things." The Lifting Jack is portable and not at all liable to derangement. Hence, it is invaluable to the mechanic and engineer.

So far as it has been possible in a single article to deal with the question of Hydraulic Engineering as seen in the Exhibition of 1862, we have dealt with it. We are certain, nevertheless, that many points of great interest in that branch of mechanical science have been omitted. The innumerable purposes to which hydraulic power has been applied since Bramah gave us the press, would render it necessary that a volume, rather than a mere paper, should be written on the subject, if justice were to be done to it. Our cursory remarks cannot be deemed exhaustive, nor much more than introductory. If we have succeeded in indicating the main features of the hydraulic display at the vast show-rooms at South Kensington, and rendered a fair tribute of praise to those who have earned it, we shall, for the present, rest satisfied.

We are of those who believe that greater—far greater—triumphs than have as yet been achieved are in store for hydraulic engineers, and we advise young mechanics especially to devote time and attention to the laws which govern the action of fluids. Water and air have heretofore been faithful ministers to man's wants. There are, however, secrets in connection with both which time, patience, and industrious research alone can reveal.

IRON WALLS AND NAVAL GUNS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Sir,—In my last letter there are some errors of the press, for the correction of which I refer to the note at foot. In that letter I incidentally remark, "the main question now is, the improvement of Naval Armour." Up to this moment no progress has been made in that direction. A series of valuable experiments have been carried on by the Iron Plate Committee, but these have afforded no results of a positive character, beyond certain indications of the properties of iron requisite for armour plates. On this point even no decisive conclusions have been formed. After two years experimenting, the most that can be said, so far as the public are informed, is that the Thames Iron Works, Messrs. Beal and Co., and Messrs. J. Brown and Co., have taken the lead in the production of plates of enormous dimensions, and by successive modifications in the modes of manufacture, have greatly improved the quality and increased the thickness of the plates. Further improvements of this kind are in progress. Messrs. J. Brown & Co., at their Colossal "Atlas" Works, at Sheffield, are setting up new machinery with vastly increased power, capable of rolling still thicker plates. That enterprizing firm in its turn will be encountered by new works, on a scale of greater magnitude, which are rapidly advancing to completion at Millwall. The Butterly Iron Company, and Messrs. Rigby and Co., of Parkgate Works, Glasgow, are also in the field with great promise of success. The former firm has given a sample of its capabilities in the monster plate exhibited in the court of the eastern annexe. The manufacture of 4½-inch plates, such as those on the "Warrior," was regarded as a wonderful feat. When it was proposed to increase the thickness to 5½ and 6 inches, grave doubts were expressed whether they could be produced without deterioration of quality. It was thought the molecules of the metal could not be sufficiently compressed. But excellent plates of those dimensions have been made, and such are the extraordinary strides of mechanical skill in this country, when brought into action, that power has been devised at the "Atlas" and "Millwall" works, which it is said will turn out rolled plates of the best quality, 8, 9, and 10 inches in thickness. It is a most important point whether rolled or hammered plates have the precedence. If the reports of the Iron Plate Committee were open to public inspection we might form an opinion, but official wisdom has determined that the records of the experiments which John Bull has paid for shall not be exhibited to his eyes or submitted to his judgment. They are printed and ready for circulation, forming a goodly collection of bulky blue books, from which the ingenious mechanic and the patient engineer might, by research and analogy, evoke much that would be useful to the nation. By the publication of these records practical results would be known, controversy would ensue, new light would be thrown on many points, and the public would get something for their money. It is understood that the Committee are most desirous their reports should be published, but certain officials whose blunders would be exposed by some of the results of target trials, have influence enough in high quarters to overrule the sensible and honest recommendations of the Committee, to defeat the rights of the public, and to consign the reports, which form a formidable item in the stationer's bill, to dust and oblivion. When will the reign of unreason cease? The taxpayers are mulcted for experiments for which their representatives vote a handsome sum, and when the money is spent and results are obtained, they are refused a sight even of what they have paid for.

This much, however, has been made known. The Iron Plate Committee have come to the conclusion that the prime condition of perfection in naval armour is immensity of size of the plates which receive the impact of projectiles. For floating structures, thickness has its limit, of which, according to present notions, 6 or 7 inches is the maximum, although for the armour of land forts 10, 12, or 15 inches of solid iron are not thought too much. But in length and width for ships or shore batteries there seems to be no limitation proposed. Plates 15 to 20 feet, by 3 to 4 feet, are actually proposed for some of the iron-cased ships now in the course of construction.

It is said to be the settled opinion of the special Committee that the principle of resistance to heavy shot is the concentration in each individual plate of the strength of a massive girder, opposing its thickness, weight, and rigidity to the smashing and crushing, as well as to the penetrating effects. At first sight there seems to be much reason in this opinion, which is supported by the fact that the longer and wider the plates the fewer the number of joints. In many trials at Shoeburyness and Portsmouth the joints appeared to be the weak points.

I venture to differ with the Committee. I may be wrong, but I will state my view and give reasons for it, hoping that the frank expression of one and the other will provoke discussion, and induce some of your correspondents who are more capable than I am to deal with engineering questions to publish their opinions in the Mechanics' Magazine.

It is, I think, a mistake to constitute the armour plate a girder to resist the crushing effect. The proper duty of the armour plate is, I contend, simply and solely to resist the penetrating effect and break up the shot. In former letters I advanced that opinion and *theoretically* drew a distinction between the crushing and penetrating effects. I did so then with some hesitation, but now I can appeal to practice, and maintain the same view with more confidence. In the recent experiments at Shoeburyness with powerful guns the *local* character of the damaging effects of the 120, 150, and 280-pounder round and elongated shot was manifest. The heavy projectiles pierced the armour plates at the points, struck and fractured the structure behind. But the damage done was in the immediate vicinity of the point of impact; the more distant parts of the plate and structure were uninjured. The girder principle was not brought into action, and did not at all tend to augment the resisting force of the plate at the point of impact. The sudden blow of a projectile, with a force equal to some thousands of tons, on a surface 6 to 10 in. in diameter, cannot be compared to the passage of a train over a railway bridge. It is another order of ideas, and requires another system of resistance. The blow is local; the resistance must be local, that is, there must be equal and sufficient resistance at every point. When the armour plate alone is relied upon, we are led to enquire in what conditions it is placed. On the "Warrior" section we find a 4½-inch plate on an 18-inch wood backing. The wood offers no resistance worth speaking of to the crushing and penetrating effects; the iron plate has to do all the work. The wood is only a medium for transmitting the blow to the ½-inch skin plate and the ½-inch angle iron frames which form the hull. In this arrangement there is nothing at the back of the armour plate to aid it in repelling the blow. The 4½-inch plate is placed under the most favourable conditions for being punched through by the missile. The perfect analogy of the impact of shot to the punching process was exhibited by the performance of

Note.—Page 237, line 9, for "point" read "points;" line 29, for "lest" read "left;" page 238, line 5, for "equally defects" read "equal objects;" second column, line 32, for "posts" read "ports;" and line 41, for "120 to 150" read "120 or 150."

the Whitworth flat-headed bolt, which cut a clean hole through the 4½-in. plate, as clean as if it had been under a punching machine. Mr. Whitworth claims by his method to cut a core out of the plate, and at Shoeburyness he did it neatly, to the astonishment and dismay of the "Warrior" party. Let it be only well understood that to project bolts made of hardened metal against iron plates is the same thing as to drive a punch through a boiler plate, and all doubt and hesitation as to the right mode of keeping out or breaking up shot will be adopted. The girder principle, "*quoad*" *penetration*, will be abandoned, and the means which would prevent a punch forcing its way through a boiler plate will be followed. If the proposition were to prevent a 1-in. punch penetrating a ¾-in. plate, would any man in his senses place it upon a wooden plank? Certainly not; for if he did the machine would drive the punch through the iron. But if an additional thickness of iron were placed under the plate, or across the orifice of the die, the punch would not penetrate the plate, and probably would be broken if the machine were powerful enough to resist the strain of the effort. This lesson is very simple, and ought to be instructive. It indicates the kind of resistance which should be opposed to shot, and the support which the armour plate requires *locally* at all parts of its back surface. It settles the point that wood is not the material to be used as backing to iron armour. I have before mentioned the law which governs the action of a punching machine. The diameter of the punch, being of steel, must equal, it ought to exceed, the thickness of the plate. If these proportions be observed the machine will do its work. Hence shot, 8 or 6 inches in diameter, projected with sufficient force, ought to and must pierce through a 4½-inch plate, with no support but wood at the back. The explosive force of gunpowder is the machine; the shot is the punch. There was, then, nothing surprising in the work done by Whitworth's flat-headed and hardened punches. Similar projectiles of larger diameter, and fired with sufficient charges, will pierce through much thicker plates if fixed upon wood, and even the 5½-in. plates of the "Royal "Sovereign," which the *Times* of Monday last, with its usual flourish of trumpets, tells us will be backed with 3 ft. of solid timber, will not save the wooden cupola ship from being a prey to the liquid fire which may be communicated to her hull by explosive shells, charged with molten iron. I I trust the supreme Government, if not the Admiralty, will listen to a warning voice in time, and before it proceeds further in the reckless system of iron-casing ships with plates on wood, it will pause to make conclusive experiments with different kinds of backing calulated to prevent projectile punches being driven through armour plates.

By the omision of a few words not very legible in the copy, it is printed in my last letter that "Si William Armstrong is superseded." What I wrote was "the supply of "Sir William Armstrong's naval gun (meaning the 110-pounder) is suspended." The former statemet may be true; if it be not it ought to become a reality, for it is an indecorous anomly, prejudicial to the service and unjust to manufacturers of ordnance, that the director o artillery, the arbiter of the class and make of guns adapted for both service, should be the *virtual* Government inspector of guns of his own invention manufactured at Woolwich, and the *quasi* Government contractor for he supply of the same guns, which the natin is bound to take into stock on a large scale for many years, under a penalty of £80,000.

Surely when Parliament assembles the Armstrong gun system, the Armstrong appointment, and the Armstrong contract, will undergo a scrutiny. In the mean time I will lend my feeble aid to keep these questions alive. The necessity of incessant vigilance is proved by an insidious paragraph in the *Times* of the 20th instant, which deliberately announces that "Armstrong 150-pounders, such as that one "*tested* against the *famous* Warrior target, will "form the armament of the 'Royal Sovereign.'" On reading this sentence I rubbed my eyes and read it again with amazement. Mark the double note of admiration "the *famous* Warrior target," and the implied prowess of the gun "*tested* against it." Let us turn to the *Times* of last week, in which the same hand writes, that the 150-pounder Armstrong having burst, could not be relied on, and moreover, it was too heavy to be used as a naval gun. But in the *Times* consistency is set at nought. I last week exposed the absurdity of its assertion that "a gun of 95 cwt. was the heaviest "that could be worked with success, or even "safety, on board a floating vessel." It now announces that 12-ton Armstrongs are to form the armament of the "Royal Sovereign," and this proves how correct I was in stating that "if the gun tested at Shoeburyness had not "burst, the Admiralty was prepared, with "much boasting of its tremendous power, to "announce its intended adoption as part of "the armament of the Warriors and North-"umberlands."

I am glad to see an intelligent correspondent of the Mechanic's Magazine, Mr. St. John Vincent Day, has taken up the question of Naval Armour. He is quite right in his criticisms of Mr. Richardson's deflective shield system. But the deflecting plan is altogether a mistake if applied in any form but the *continuous* circle or inclined plane. Mere deflecting projections, instead of offering any advantage, are sources of weakness, by presenting protruding points to be more readily shot away, and facilitating the destruction of the armour piecemeal. Mr. Day submits a plan which in principle is the counterpart of Mr. Roberts and Mr. Westwood's angulated systems, both of which were tested in the shape of trial targets unsuccessfully. Mr. Day wisely does not accept the responsibility of contriving a fastening. There lies the difficulty. Without an efficient fastening no form of plate is available. If that gentleman will exercise his ingenuity, and invent a fastening which will hold plates effectually against the shock of cannon balls, he will render a public service.

CIVILIAN.

INTERNATIONAL EXHIBITION. JURY REPORTS.

CLASS VIII.—MACHINERY IN GENERAL.

(*Continued from page* 244.)

General Explanations and Remarks.

M. Lecointe (France—1,166) has obtained a simplification still greater: his apparatus of pumps and cisterns can supply twelve presses. It consists of two force-pumps, the contents of which are led into a reservoir of variable capacity by the play of a plunger moving vertically, weighted to 1,200 or 1,400 lbs. to the square inch. It is this reservoir which distributes the water to the presses at this constant pressure. If the pumps furnish more water than is used, the regulating piston, arriving near the extremity of the stroke, raises a balance weight, the action of which immediately cuts off the action of the pumps. The power returns as soon as the piston of the reservoir is lowered; but this return of power is combined in such a way that it takes place only at the commencement of the stroke of the piston, so as to drive the water with slow velocity at first—essential to the preservation of the machine. The mechanical regulator is ingenious; but it is advisable to avoid the noisy shock of the connecting rod against the clutching lever, which continues so long as only one of the pumps is in action. With the exception of this objection to a matter of detail, the machine of M. Lecointe presents a very important progress in the production of hydraulic presses, and the success which this machine has obtained in a great number of works is perfectly well deserved.

Water-meters, &c.

Water-meters are of many different constructions. That of Mr. Siemens (United Kingdom—1,987), which was to be seen in the Exhibition of 1851, consists of a small turbine traversed by the water to be measured. It remains to be decided by well-authenticated trials whether this instrument registers accurately under the different pressures with which water may have to traverse it.

The other systems of meters consist of filling with water a constant capacity, and registering the number of the operations. That of Mr. Jopling, exhibited by Messrs. T. Lambert and Sons (United Kingdom—1,903), is of very simple construction. It is composed of two equal parallel cylinders, of which the pistons work together in the same direction, the piston rod of each piston regulating at the extremity of the stroke the admission of the water into the neighbouring cistern. All the water must pass through one or the other of these two cylinders; and the number of oscillations registered measures the quantity of water which has passed. The cylinders are enclosed in a case of cast iron, so that the pressure is the same at the exterior as the interior of the cylinders, and its influence on the play of the machine is nearly annihilated.

The Manchester Water-meter Company (United Kingdom—1,923) exhibit several water-meters. One of them is provided with only one cylinder, in which the introduction of the water is regulated by a system of two pistons, which are alternately driven in different directions by a slide, the position of which is changed by the piston rod of the large piston at each end of its stroke. Among the other water-meters of the Company may be seen one (Frost's patent) without packing, which will work with warm water, for the filling of steam-boilers. It is composed of two pumps, formed each of a rectangular box, moving horizontally in the right angle formed by two fixed planes. A partition fixed perpendicularly to the intersection of the two planes, and filling the section of the box, performs the office of a fixed piston, and separates the two cavities of the box, which fill alternately, as they are extended. The box slides in grooves adjusted on the fixed planes, each governing the slide valve of the other. It would be very desirable that regular experiments should be made with these instruments, which would be very rapidly adopted by the public, could they confide in the register of the machines.

M. Sacré (Belgium—277) has exhibited a hydrometer for distilleries. The liquid is measured as it leaves the still, at the same time that a small quantity of liquid, variable at pleasure, is preserved at each measuring, and conducted into a special receptacle, which allows of recording readily the mean density of the liquid distilled.

Section II.—Cranes.

The principal kinds of machines for lifting exhibited are either cranes or jacks.

With the cranes are ranged those called Derrick cranes, presenting generally an extended basis, and consequently great stability. Cranes properly so called are either fixed or movable, worked by hand, steam or water. We remark in the two first classes the system of M. Neustadt, exhibited by J. F. Cail and Co. (France—1,141), and C. Fauconnier (France—1,161), which con-

sists in applying to cranes the Galle chain. This chain, formed of plates of wrought iron united by pins, has no forged joints, and presents a very great solidity. It adapts itself to the teeth of a pinion, and the free extremity of the chain is received into a box or directed into a sheath. This system presents over the others the advantage of doing away with the drum and one of the cog wheels, seeing that the diameter of the pinion is about one-third of that of the drum; of avoiding the oblique winding of the chain, and consequently of notably simplifying the construction of cranes. An experience of seven years has confirmed the use of cranes with the Galle chain. Nearly 500 of them have been constructed, and are used in large establishments. Amongst the most important are those of the Imperial Marine of France.

A crane moved by hydraulic pressure forms part of the exhibition of Sir William Armstrong and Co.(United Kingdom—1,785), and which also appeared in the Exhibition of 1851. The drum is totally suppressed; the chain of the crane when it reaches the head of the vertical standard is passed over pulleys; one of the pulleys is fixed and the other is set in movement by a piston of a hydraulic press. The rotation of the crane is also effected by the pressure of water. This crane is suitable for a locality where water is distributed at a high pressure. It can be fed from a high-pressure hydraulic reservoir, the reservoir itself, fed by force-pumps driven by steam furnishing an advantageous means of replacing the continuous work of the machine by the intermittent work of the crane. The Armstrong system comprehends also a capstan moved by water under high pressure. Three pumps are thus put in motion, and work together on a horizontal shaft, carrying a conical pinion, which works against a wheel fixed at the base of the capstan.

Messrs. Ransomes and Sims (United Kingdom—1,961) have exhibited a portable steam-engine which can act as a steam capstan. A winding drum is placed beneath the boiler; it is driven by a conical-toothed wheel, put in motion by the steam-engine situated over the boiler. The whole of this arrangement is ingenious; but it may readily be understood that this machine cannot exercise very great power. The machine exhibited could only raise 25 cwt. The most useful application of it would be in the raising of building materials.

The hydraulic lifting jacks, already seen at the Exhibition of 1851, have become more numerous. In those of Messrs. Adamson and Co. (United Kingdom—1,780), the oscillations of the lever in raising are lessened by an angle block which butts against the head of the jack. It is only by moving the lever laterally on its axis that the stopping of the operation is prevented, and that the water from the bottom of the press is allowed to pass into the head of the jack, causing at the same time the lowering of the object lifted. With the machine of Messrs. Tangye Brothers and Price (United Kingdom—2,002), the lowering is obtained by a special screw. These instruments are simple and offer great advantages over those with rack wheels.

We must also draw attention to the crab of Mr. Winand (Belgium—28), set in motion by an endless screw, which can guide the gearing but cannot be moved by it. The lowering of the weights can only be obtained by turning a handle in the opposite direction, or by unwinding the screw when a rapid movement is desired.

SECTION III.—PILING ENGINES.

The Jury have granted no awards in this section.

P. LUUYT, *Reporter.*

SECTIONS II. & III.—REGISTERING INSTRUMENTS, AS GAUGES, INDICATORS, AND TELL-TALES.

Great improvements have taken place of late years in articles under these heads, and have thereby contributed greatly to reduce accidents in steam-boilers, by accurate notation of pressure, height of water, &c. The steam-gauges exhibited are in most cases constructed with discs of thin metal, corrugated and plain, secured and made steam-tight at the outer edge, the pressure acting upon the surface, and the amount of deflection is communicated to a movable pointer, which indicates upon a dial the exact amount of pressure. Others are constructed with diaphragms of india-rubber, the pressure being met with spiral or volute springs, and the motion communicated as above. The bent tube manometer of Mr. Bourdon is a most ingenious and correct indicator of pressure, and under all circumstances the best in the Exhibition. Indicators and tell-tales of simple construction and practical utility are well represented. For the most part these are automatic, being self-acting for the regulation of feed-water, and giving notice by whistle of conditions where it is necessary to call attention.

Allen, Harrison and Co., Manchester (United Kingdom—1,782).—Gun-metal fittings for steam-engines. Medal awarded for good workmanship and general excellence. This firm exhibit a very excellent safety plug for steam-boilers; a valve seat is placed or fitted into the boiler flue over the fireplace, having a lid or valve with perforations filled with metal fusible when not covered with water.

Frieake and Gathercole, Mark-lane (United Kingdom—1,857).—Salinometers, telegraphs, indicators. Medal awarded for good workmanship, &c.

Routledge and Ommaney, Salford (United Kingdom—1,972).—Engine-pumps, boiler-feeders, magnetic machines for separating iron and brass. Medal awarded. Practical utility. A very useful and efficient boiler-feeder is exhibited by this firm, which may thus be briefly described:—A small, close cistern (through which the feed-water passes) is placed in connection with the boiler; steam is first admitted into the cistern and afterwards condensed with a small quantity of cold water, thus forming a vacuum, which by a self-acting arrangement causes the cistern to fill with water from the hot-well of the engine or any convenient source. Steam is then admitted so as to act with equal pressure to that in the boiler, and the water enters the boiler by its own gravity; this apparatus is very perfect in its action, and will feed with water at any temperature below 200 degrees.

G. Salter and Co., West Bromwich (United Kingdom—1,978).—Spring balances, dynamometers, pressure-gauges, &c. Medal awarded. Excellent workmanship, practical success. These owe their efficiency to well-tempered springs, and are not surpassed. The pressure-gauges act by means of the steam or the water pressing against an india-rubber plate, on which lies a metallic plate with rod in connection with the mechanism, and which is kept down by one of Salter's springs.

J. Chandler, Mark-lane (United Kingdom—1,817).—Flat glass water-gauge for boilers. Honourable mention.

Smith Brothers and Co., Nottingham (United Kingdom—1,991).—Pressure and vacuum-gauges. Honourable mention. These gauges are on the priciple of Salter's, excepting that a volute spring instead of a spiral is used, a diaphragm of india-rubber preventing the passage of steam.

F. Wise, Adelphi (United Kingdom—2,028).—Feed-water regulator, indicators, alarm for steam-boilers. Honourable mention. The regulator for steam-boilers consists of a copper float attached to a lever within the boiler; to this lever is connected a small gun-metal slide, which rises and falls with the float, and when the water level is slightly in excess of the proper height, opens a port whereby air or steam is admitted to the suction pipe or working barrel of feed pump, thereby suspending its action until the water is below or at its proper level.

J. White, Borough (United Kingdom—2,021). —Engine oil-feeders, &c. Honourable mention.

E. Bourdon, Paris (France—1,156).—Manometers, barometers, injectors, centrifugal pumps, &c. Medal awarded. Originality of design; good workmanship of the several articles; practical success of manometers and barometers. Mr. Bourdon has a very interesting exhibition of pressure-gauges, vacuum-gauges, barometers, &c. These are based on the principle of the distortion of tubes having elliptical sections by an internal pressure, and torsion or twisting by external pressure. In these pressure-gauges a curved tube of elliptical section is fixed at one end, both ends being hermetically sealed. Steam is admitted, which has a tendency to straighten or uncoil the tube; the other end is attached by a small link and lever to an indicating finger. Mr. Bourdon also uses a twisted tube, in the form of a quick-threaded screw; steam being admitted has a tendency to untwist the tube, and the motion is communicated to the indicating finger as before.

A gauge for very high pressures is made by having two curved tubes, filled with water, in connection, one being secured in a vessel so as to be acted upon externally. This causes a pressure to act upon the exposed tube internally, and the movement is communicated to dial, as before.

Mr. Bourdon also exhibits several modifications of a mode of raising water by jets of steam, which are in all respects on the principle of Giffard's injector for feeding boilers.

L. J. F. Desbordes, Lyons (France—1,100).—Manometers, pyrometers, barometers, &c. Medal awarded. Good workmanship; practical success.

Desbordes and Roudalt, Paris (France—1,139). —Manometers, &c. Honourable mention. These manometers act by pressure upon a flexible disc, which gives its indication upon a dial by means of a lever and toothed quadrant working into a small pinion on the pivot of indicating needle.

A. Achard, Paris (France, 1,023).—Electro-magnetic safety apparatus. Medal awarded. Ingenious and original design. This machine is very perfect in its action; and in addition to its being a self-acting regulator of the supply of feed-water to the boiler, gives notice by ringing a bell of any derangement under the following circumstances:—

When the water is too low or too high.
When the steam is too high.
When the feed-pump is out of order, and
When the apparatus itself ceases to act.

F. T. Moison, Mouy (France—1,171).—Dynamometers. Medal awarded. Original design; practical utility. The dynamometers of Monsieur Moison are very ingenious and practical; the driving pulley gives motion to the machine to be tested, through three bevel wheels in the usual manner, one being placed upon an axis at right angles with the other, its fulcrum being the shaft upon which the other two wheels revolve. The power is registered by dials acted upon by the spindle upon which the intermediate bevel-wheel is placed. Monsieur Moison also exhibits a steam-engine and water-wheel governor; the former acts much in the same manner as the dynamometer, a fly-wheel being driven by wheels fixed upon a balance lever, upon one end of which is a weight tending to depress it. When the speed of the engine is such as to overrun the fly-wheel, the weight is raised and the throttle valve closed; the latter is a pendulum or ball governor, running horizontally, having a spring to counteract the tendency of the balls to expand. On one end of the governor spindle is fixed a spur-wheel, which gears into another running loose upon a shaft, parallel with governor spindle; on the opposite end is a conical pulley, giving motion by means of a strap to another pulley which runs loose on the same spindle as that on which the spur-wheel is placed. The strap is moved by means of the ball governor, giving a varying speed to the driven cone pulley. The driven spur-wheel and driven pulley are connected by means of an intermediate bevel-wheel, and when the speed of one exceeds that of the other, a motion is communicated so as to open or close the water sluice.

David Brothers and Co., Port Quentin (France —1,106)—Instrument to test the strength of thread. Honourable mention.

Dedieu and Co., Lyons (France—1,159).—Manometers. Honourable mention In this the

steam acts upon a disc of metal, motion being communicated to the indicating needle by an eccentric and levers, a coiled spring preventing any play.

P. Renaud, Nantes (France—1,141).—Float for steam boiler, and alarm. Honourable mention.

Lethuillier-Pinel, Rouen (France — 1,140).—Magnetic indicators of water level. Honourable mention. In this a magnet, moved by a float inside the boiler, causes a small light steel roller to rise and fall outside a face plate on top of boiler, and indicates correctly every change of level of water.

J. C. Gore & Co., Jamaica Planes (United States—36).—Belt shifter. Medal awarded. Originality of design; probable utility. A very simple and effective invention. The belt shifter is moved and locked by one motion, thereby preventing the possibility of accidental movement so as to prevent the starting of any machine at an improper time.

S. Elster, Berlin (Prussia—1,395).—Gas-testing apparatus. Medal awarded. Originality of design, good arrangement, and good workmanship.

A. Sacré (Belgium—277).—Hydrometer. Honourable mention.

Near & Co., New York City (United States—27).—Dynamometer. Good arrangement; practical utility. Medal awarded. This is a very ingenious machine, but difficult to describe without a drawing. Two pulleys are mounted upon a spindle, one being connected with the motive power, the other with the machine to be set in motion, one being loose, the other fast; the former exerts its power upon an inclined plane, which acts longitudinally upon two spiral springs, and these indicate their pressure on a scale or counter fixed to the framework of the machine. This counter, besides being actuated by the force and motion of the driving pulley in a uniform manner, is caused to revolve in an increasing ratio as the pressure or force increases, by means of a cone, which advances or recedes with the spiral springs, and which gives its motion to the counter by a friction roller.

Böckenhagen (Mecklenburg-Schwerin, 37).—Spirit gauge. Honourable mention.

E. Drewitz (Prussia—1,295). — Alcoholometer for quantity and strength. Honourable mention.

Schäffer and Budenberg (Prussia — 1,316).—Manometers; steam-engine fittings. Honourable mention. These manometers act by pressure upon a corrugated plate of metal, and give motion to the needle by a lever and toothed quadrant and pinion; they have proved very effective in practice, and can be relied on for their accuracy.

O. M. Hempel (Prussia—1,404).—Steam-pressure gauge. Honourable mention.

Watremez and Kloth (Prussia — 1,325). — Black's safety apparatus for preventing the bursting of boilers. Honourable mention.

D. A. Löhdefink (Hanover — 379).—Manometers. Honourable mention.

J. J. Gutknecht (Switzerland — 154).—Apparatus to measure spirits and water; dry gas meter. Honourable mention.

Waltjen and Co. (Bremen—6).—Friction balance and oil test. Medal awarded. Good design, practical utility of oil test. This apparatus is intended to determine the description of oil best suited for lubrication of shafts at certain given velocities.

A shaft supported on two bearings is fitted with a sliding friction pulley, driven from a friction disc, placed at right angles to the shaft. The sliding friction pulley is movable from the centre of the disc to its circumference, so as to allow of increasing or diminishing the speed. One end of the shaft is fitted with a worm gearing into a worm wheel, which registers the number of its revolutions. The other extremity of this shaft is fitted with a collar, and upon this collar the balance disc is supported by a segment of a step. The balance is weighted by two pieces of metal of equal weight, suspended from the two ends of a strap which passes over it. On each side of the balance a knob is cast to the circumference, one of which knobs is bored out to receive a cylindrical weight, which screws in and out. The various parts of the balance are so adjusted that its point of gravity falls a little below its centre, and a hand fixed at the lower extremity of the balance shows when it is in a vertical position and accurately balanced. The oil-cup passes through the centre of the step segment to the point of contact with the collar. The apparatus being put in motion, the smallest amount of friction will tend to raise that side of the balance which is fitted with a sliding weight, which is thereupon screwed out so as to increase the weight on that side until the friction is counterbalanced, when the scale marked on the sliding weight will indicate in pounds and ounces the amount of friction on the collars at the given speed with the oil used. On testing various kinds of oil at the same speed, it will be easy to ascertain which quality produces the least amount of friction.

J. Adcock, Dalston (United Kingdom—1,781).—Distance indicator for wheel carriages. Honourable mention. A small air cylinder is fixed vertically to the axle of the carriage near the wheel, and communicates by means of a non-flexible india-rubber tube, with a second air-chamber, being part of a clockwork which renders the number of revolutions of the wheel. The boss or nave of the wheel is fitted with a curved arm or rod, which after each revolution of the wheel depresses one arm of a bell-crank lever, the other arm of the same acting upon and depressing the piston rod, which is attached to the centre of an india-rubber disc with which the cylinder is fitted; on the disc being thus depressed, a portion of the air in the cylinder will be forced through the tube to the air-chamber of the clock-work, and inflate the india-rubber disc or bag of the same. The centre of the disc is connected with a pall of a ratchet-wheel, and each time the air is forced into the air-chamber the pall will rest upon the ratchet-wheel and cause it to move forward one tooth, and thus register by means of the clock-work the distance passed over by a revolution of the wheel. The arm of the nave having passed the arm of the bell-crank lever, the disc in the cylinder will, by its own elasticity, or by means of a spring, rise and again admit the air into the cylinder, the same body of air being passed to and fro between the cylinder and the air-chamber, and no valves being required. The apparatus is at once simple and effective, and not liable to get out of repair.

R. and L. R. Bodmer (United Kingdom—1,801).—Safety valve. This being exhibited by a Juror could not be made the subject of an award, but the Jurors wish to record their appreciation of it. The peculiarity of this valve consists in the valve edge being raised by a column of steam of water, entirely independent of the escaping steam; a tube formed in the centre of the valve is connected by means of a pipe with the steam space or water of the boiler; at its upper end this tube is enlarged, and forms a piston of the diameter of the valve; and the valve cap, made in the form of an inverted cylinder open at the bottom, fits on the piston, and rests on the valve seating in the usual manner. When the steam pressure exceeds that to which the cap is weighted, the steam or water, acting upon the end of the inverted cylinder valve cap, will lift the same in proportion to that pressure; but on any sudden accumulation of steam taking place, the valve will at once open to its full extent, and immediately relieve the boiler of its surplus pressure.

With a slight modification, valves on this principle can be constructed with a lifting area of exactly one square inch, less or more, whilst the diameter of the valve may be three, four, six, or more inches.

These valves are particularly adapted for being weighted direct, by means of weights or springs.

F. Normand, Paris (France — 1,179).—Improved method of correcting the error of the universal joint in transmitting motion. Medal awarded. Originality of design, practical success.

J. N. Mauzaize, sen., Chartres (France—1,197).—Engaging and disengaging gear.

The reporter of the foregoing articles under Subdivions II. and V. has preferred giving a short general report, and has added a more detailed description under the head of each, where he considered the articles deserve special notice.

J. HICK, Reporter.

APPENDIX TO CLASS VIII.

SPECIAL JURY FOR FIRE-ENGINES.

J. F. Bateman, F.R.S., London; Civil Engineer.
Capt. Bent, London; Superintendent of Fire Arrangements in the Exhibition.
W. M. Brown, London; Superintendent of Westminster Fire Brigade.
Earl of Caithness, London.
J. Hawkshaw, London; Civil Engineer.
C. Jenny, Austria; Councillor of Mines in the Imperial Royal Academy of Mines at Schemnitz.
P. Luuyt, France; Engineer to the Imperial Commissioners of Mines.
J. E. McConnell, Wolverton; late Locomotive Superintendent of the London and North-Western Railway.
O. Pihl, Norway; Civil Engineer.
W. J. M. Rankine, Glasgow; Professor of Mechanics in the University of Glasgow.
Capt. Shaw, London; Superintendent of the London Fire Brigade.
Duke of Sutherland, London.
F. B. Taylor, United States; Mechanical Engineer.
H. Thomas, Zollverein; Manufacturer.
H. Tresca, France; Professor of Mechanics, President of the French Institute of Civil Engineers.

Report of the Special Committee of Class VIII. on Fire-Engines.

The respective merits of the engines were considered with reference to the following points, those engines being recommended for medals or other approval which combined excellence in the greatest number:—

1st. The weight and size of engine.
2nd. The quantity of water delivered at certain heights and distances.
3rd. The depth from which the water was drawn.
4th. The power employed.
5th. The material, price, and general construction.

Due notice having been given of the time and place of experiment, the mode of procedure, the rules to be observed, and the tests to which the engines would be submitted, the following gentlemen attended a meeting for previous consultation, and expressed themselves perfectly satisfied with what was proposed:—

Messrs. Blinkhorn and Shuttleworth;
M. Letestu;
Messrs. Merryweather and Son;
Mr. Henry Roberts;
Messrs. Shand and Mason;
Messrs. T. Warner and Sons.

At the same time Messrs. Shand and Mason and Messrs. Merryweather and Son requested that time should be allowed them to prepare their respective steam fire-engines for the trial.

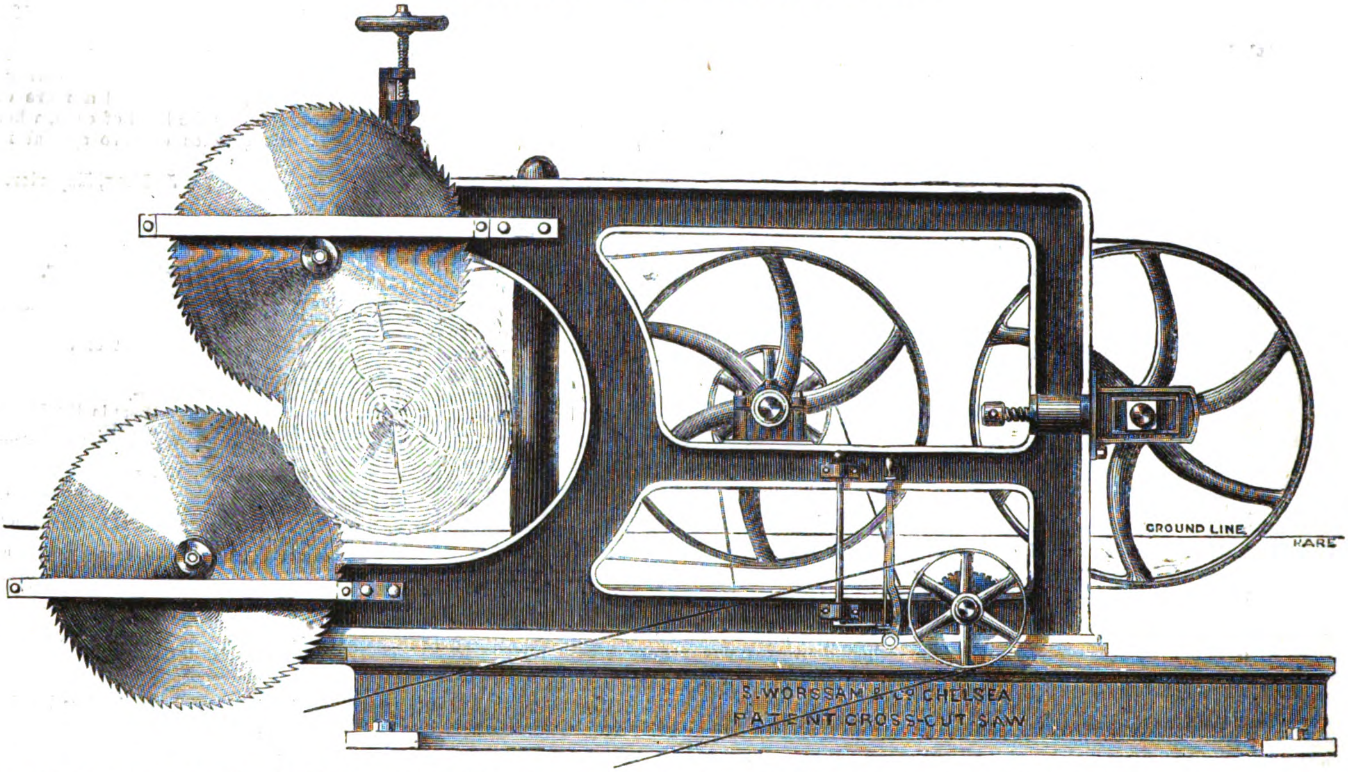
The distinctive feature in these trials, as compared with former experiments, was the measurement of the water after delivery, which was accomplished in the following manner:—

Water targets were constructed, consisting of hoods of canvas, with a circular opening of six feet, that space being considered the utmost limit to which a jet can spread without being dissipated into spray, and so becoming useless when projected on a fire.

These targets were elevated on a horizontal cross pole, which was raised to any required elevation on posts erected for the purpose. To each target was attached a tail or shoot, also of canvas, through which the water which struck inside the target was conducted into a gauged trough or tank which stood below, and in which the quantity delivered was read off from a graduated index.

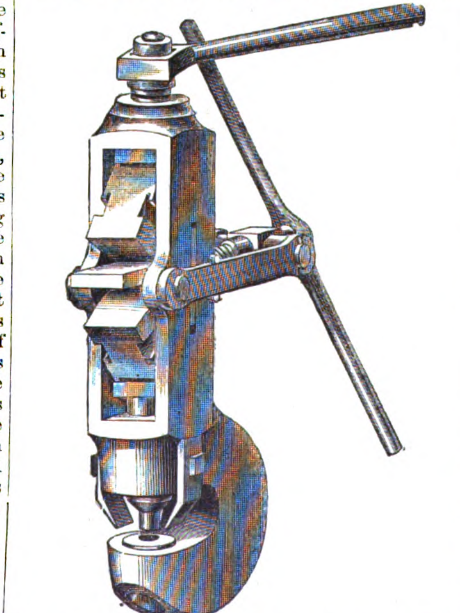
To be continued.

WORSSAM AND CO.'S CROSS-CUT SAW.



The above is a side elevation, half-inch to the foot scale of a machine we lately inspected, for cross-cutting large logs of timber, and made by Messrs. Worssam and Co., of Chelsea. This particular one was ordered by Captain Schwartz, Russian Imperial Commissioner in England, for the Government dockyards at Cronstadt. The saws are 42 in. in diameter, having a traverse of 4 ft. 6 in., the counter-shaft making 100 revolutions per minute. The whole machine weighs about 3 tons, and requires an average of six horse power to drive it. It is intended to cut round or square timber up to 30 in. in diameter. The cut is made by two circular saws working in the same plane one above another, the lower half of the log being cut by the bottom saw, and the other half by the top one. The saws, together with the arrangement for driving them, are attached to a strong framing of cast-iron, which slides upon a fixed bed, the whole being worked backwards and forwards by a self-acting motion, driven from the spindle which carries the lower saw. The upper saw spindle is fitted to a slide, somewhat like the arrangement for raising and lowering the tool-slide of a planing machine, which therefore permits it to be raised or lowered to take saws of various sizes, or to take up the wear of the saws. By the peculiar arrangement of driving both the saws from the same band, running over a tightening pulley, the strap can always be kept at the required tension. The machine is driven from an intermediate shaft, which can be fixed either below or overhead, the first arrangement being the preferable one. This shaft is attached to a weighted framing of cast-iron, working on a hinge joint, which allows of its rising and falling to adapt itself to the motion of the sliding carriage. Two oak columns are fitted into cast-iron shoes in front of the machine, on each side, to protect the saws from the timber when being rolled into the required position. One new thing about this machine is the arrangement to keep the saws steady. In addition to the usual longitudinal packed guides, shown in the engraving, there are other peculiar guides to support the saw before it enters the wood. These guides are on hinges, so that they may fold down in a vertical direction when they come against the timber. Of course, the principal and most important novelty about this wood-cutting tool consists in the use of the two smaller saws instead of one large one; and it certainly is a very simple and ingenious way of getting over the manifold objections to a large saw. To do the work of these 42-inch saws, a 7-feet diameter saw would be required, costing £123, wholesale price, measuring in thickness No 10 wiregauge (about $\frac{1}{4}$ inch), being difficult to get sound, and also liable to wobble while doing its work. One 42-inch diameter saw costs £9, measures one half the thickness of a 7 ft. one, and takes therefore so much the less power to drive it, there being at the same time much less risk in its use and its manufacture, while the fact of less power being required, enables a lighter and therefore cheaper frame to be used.

COOK's PATENT PORTABLE HAND PUNCH.



This machine, which weighs about 50 lbs., punches holes in $\frac{5}{8}$-in. boiler plate; and will make ten holes whilst a drill makes one. The machine works well, and is so simple in its construction that a boy can use it.

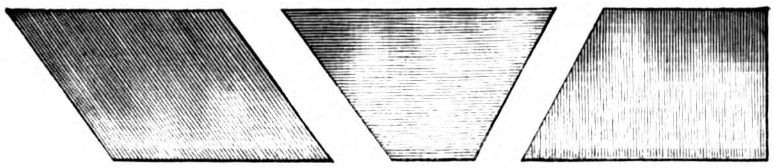
In using these punches attention should be paid to the following instructions:—With a centre-punch a small hole should be punched in the plate, for the centre in the face of the punch to drop into. The back nut of the punch should be turned backwards until the T piece presses firmly against the cams, carrying them to the front of apparatus until the faces of the hinge joints in front are in contact. The cams being in this position their shortest radii are opposite each other. The top screw should then be turned upwards, raising the whole of the interior works of the punch sufficiently high to admit the plate under the punch. The centre point on the punch having been placed in the centre mark on the plate, turn the top screw downwards, pressing the face of the punch firmly and hard upon the plate. Now turn the back nut, so as to draw the wedge towards the operator; this will draw the cams with it, bringing their longest radii opposite each other, until the faces of the hinge joints at the back are in contact. The back nut must on no account be turned beyond this. The top screw must now be turned downwards again, which will force the burr out of the plate. After this, turn the back nut backwards, forcing the T piece forwards, and bringing the cams to their first position; then raise the top screw, which will draw the punch out of the work, when the instrument will be ready for the next operation.

Further information may be obtaiued from Messrs. Ransome & Co., Essex-street, Strand.

The Building News says that Melbourne has been provided with water-works at a cost of about £820,000. Though the population of Melbourne is only 123,000, the supply, which is at the rate of 100 galls. per head per day, is estimated to be sufficient for 200,000 persons. This affords a striking contrast to the quantities supplied in England to the inhabitants of our principal and more thickly-populated towns. London is only at the rate of 20 gallons per head; Nottingham is 40; while Wolverhampton and Liverpool have only 11 gallons per head daily. The consequence is that the supply of water in Melbourne is more than sufficient for the wants of the inhabitants, and will continue to be so for years to come.

IMPROVEMENTS IN THE CONSTRUCTION OF WAR VESSELS, FORTS, &c.

Fig. 1.



These improvements consist in the construction of the hulls of ships or such parts as may be required, cupolas and forts, of iron or steel, or both, in one mass by welding together the slabs or plates necessary for their construction *in situ*. Riveted joints, separate armour plates, and, when the metal is sufficiently thick, both ribs and wooden lining may be dispensed with; at the same time, it is said by the inventor that structures of greater stability, sounder workmanship, and of more enduring powers, will be produced than those made upon any previous plans. The metal used may be of any thickness, but need not be in pieces of more than one-fourth the area of ordinary loose armour plates, whereby economy in price, and facility in handling, will be among the advantages obtained.

The principal conditions, plant, and processes, necessary for carrying out this invention consist of:—

1. Tough iron or steel slabs, or plates forged of suitable thickness, and generally to the shapes shown in fig. 1.

2. The usual stationary and portable templates showing the configuration of the work to be executed.

3. The progressive erection of strong and roomy stages, both inside and outside of the intended hull or other work, on which are placed tramways for the transit of trucks and small locomotive steam-hammers; the latter made so as to deliver their blows on the slab to be welded in any required direction.

4. Planing machines, by which the edges of the slabs or other work are serrated or grooved, so as to lock into each other and be expeditiously and equably fused at a depth not greater than one-tenth of an inch, which is found sufficient to make a sound joint. One form of serrations is shown on Fig. 3.

5. Bending machines, to give the material proper forms and curvatures.

6. Suitable guides to keep the welding parts in true position while under the influence of the steam-hammer.

7. Intervening cushions or striking blocks, with serrated and grooved faces, to protect the outer edges of the slabs from injury by the hammers.

Fig. 3.

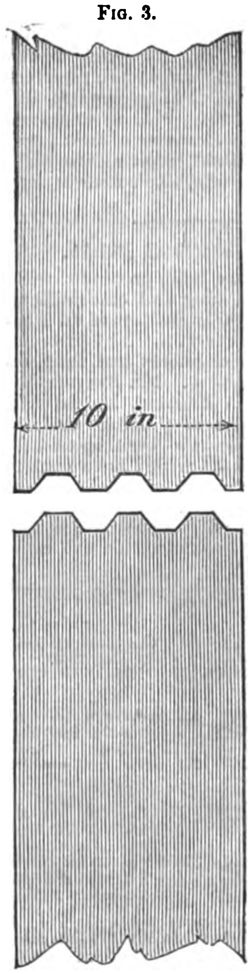
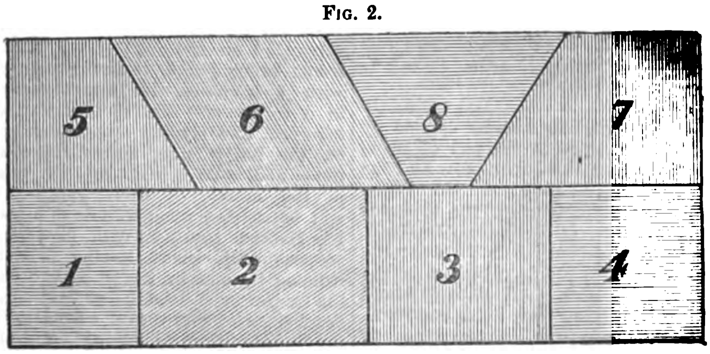


Fig. 2.



8. Blow-pipes, for the delivery of oxygen gas combined with carburetted hydrogen, of improved construction and sufficient power, and in the requisite forms to weld seams of any thickness, length, and shape.

The apparatus by which the oxygen gas is generated consists of an iron retort, in which oxide of zinc and nitrate of soda are decomposed, their products being chiefly oxygen; there are also a separator and condenser by which the products of distillation of the above ingredients are divided and cooled before the oxygen enters the gasholder. The carburetted hydrogen could be produced by a similar plant, but it is more convenient to take it from the street main gas pipe. These gases are brought together into one flexible tube, constituting in fact, with its improved burner, a movable blow-pipe capable of being regulated, moderated or made to burn with the greatest conceivable intensity, melting even platinum as if it were sealing-wax.

One of the most important facts connected with the present invention is that oxygen gas is *no longer a costly commodity*, being now made at less than 7s. per thousand feet, whereas that from manganese, the only ingredient which formerly produced oxygen, cost from £8 to £10, so that this indispensable gas, made as here described, is the cheapest fuel extant for all purposes requiring an intense and controllable heat, either constant or intermittent, concentrated or diffused.

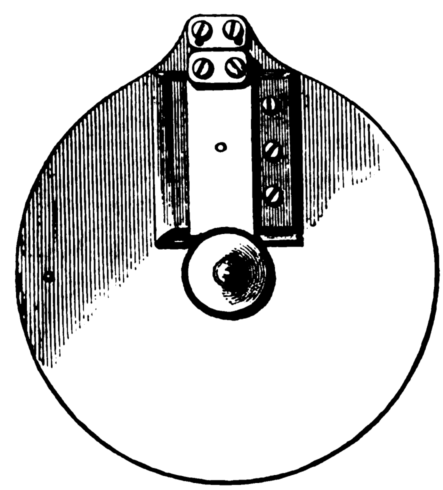
The following examples of making and welding joints by this invention will, it is presumed, satisfactorily attest its practicability, expedition, and trustworthiness. Sufficient materials having been prepared, the gas-holders charged, and all things ready for uniting the metal, the workmen commence on a butt joint, as shown in Fig. 2. No. 1 slab is a little elevated, set on its edge, and firmly fastened to a bed plate. No. 2 slab is fastened on a truck, also on its edge, with its front end projecting a foot or so over the truck towards No. 1, and its other end furnished with a cushion. This truck runs on a pair of V-shaped rails. The front end of No. 2 is run up into the end of No. 1 slab, and adjusted to fit it, and then run back from four to six inches. A light horizontal steam-hammer follows on another truck until its head touches the cushion; in this place the truck wheels are scotched. Fire bricks and lumps are placed on the back and on the top of the gap thus formed by the ends to be united and other open places where it is desirable to keep the heat in. The blow-pipe is now made to send forth its caloric on all parts of the serrations to be united during a few minutes, or until their surfaces are equably fused, when, in obedience to a signal, the steam-hammer pushes No. 2 slab, truck and all, forward, and a few rapid blows from the steam-hammer make the joint. The men with small hammers trim up the exuding metal, and the joint is finished. The united plates are now propped up, the slab truck released, and loaded with No. 3 slab, which is welded on to No. 2 as before described; the same with No. 4, and so the work progresses with facility and rapidity until the required length of a man-of-war's keel, for example, is constructed in one piece.

After No. 5 slab has been lowered by the hoisting gear and the guiding apparatus adjusted, it is raised a few inches, backed with fire bricks, and the whole of its lower edge, also the top edges of Nos. 1 and 2, are fused by means of the blow-pipe, and No. 5, welded on to them by a steam-hammer, which strikes downwards. Then follows Nos. 6 and 7, which are subjected to similar management, the tier being finished by the gravitation of No. 8.

DESCRIPTION OF ROBERTS' ECCENTRIC METAL GAUGE.

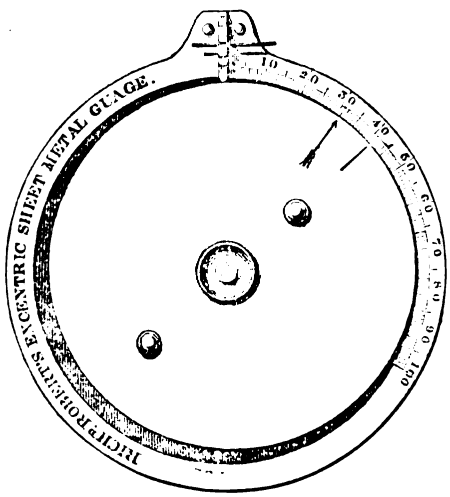
By the Inventor.

A circular brass casting, as seen in the drawing, 4½ in. diameter, having a boss at the back, is recessed in the lathe to the depth of 1-7th of an



inch; the diameter of this recess is 4 in.; concentric with the recess is drilled a hole in the brass casting. A circular plate of steel is procured, about 4 in. diameter and 1-12th thick, in which a hole is drilled about ⅜th in. diameter and 1-10th in. out of centre; into the plate a steel pin is turned to fit the hole in the plate and the brass; the steel pin is provided with a large flange-like head, secured to the plate with three screws; the plate is turned 1-10th in. eccentric to its pin until it will just enter the recess in the brass casting; upon the back of the brass is a steel slide, from which projects upwards through the brass a "steel jaw," which is thrust inwards against the plate by a spring lying at the bottom of the recess. To a lateral projection of the brass is secured a fixed steel jaw, which, when the steel plate presents its largest radius to the sliding jaw, the fixed jaw is secured in contact with the sliding jaw; both jaws must be very

accurately finished, so as to prevent the light passing between them. There are two studs riveted into the steel plate for the purpose of



turning it. The margin of the brass beyond the recess is divided into 300 equal parts, commencing at the centre of the fixed jaw; and as the gauge would be too fine for any practical purpose if marked from the greatest radius of the steel plate, I merely use the centre mark for adjusting the gauge, after which I mark it at 10 points to the right from the longest radius, and call that No. 1, which is fine enough for gauging the finest balance spring. After No. 1 the succeeding numbers increase by accelerating increments up to 75 deg., after which the reverse will be the case. Numbers beyond 75 deg. will seldom be required in the watch trade, therefore the evil will not be of much consequence up to 100 deg., which is as far as is desirable to engrave it.

THE COINAGE OF JAPAN.

The coinage of Japan is at once the most peculiar and the most ugly and inconvenient of any in existence. There are two kinds of gold coin current among the Japanese; one of these, the largest, is known as the Ko-ban, or Copang. It is of a flat oblong form, with rounded ends, and has a series of hieroglyphics stamped upon its surfaces. The length of the piece is 2¼ in., and its width 1¼ in. Its weight fluctuates between 200 and 193 grains English, and its standard of fineness ranges from $\frac{154}{288}$ to $\frac{161}{288}$; its intrinsic value, therefore, varies from 18s. 5d. to £1 sterling. The leaf-like designs which ornament each end of the obverse represent the arms of the Dairi; the characters immediately beneath give the weight and value of the coin, and the name of the mint-master by whom it was struck. In the middle of the reverse is the mark of the general director of the gold and silver coinages, and smaller marks surrounding it at irregular distances show that it has passed through the balances of private individuals, and not been "found wanting."

The second gold piece is of an oblong form, with square ends, and is much smaller than its companion, its length being ¾ in., and its breadth ⅜ in. Its name is *Itchebo* or *itjib*. The weight of the older coin of this denomination is 68 English troy grains, and its standard of fineness is equal to $\frac{669}{1000}$, and its value 6s. 10½d. The present Itchebo of Japan weighs 50 troy grains, has a standard of fineness equal to $\frac{656}{1000}$, and is worth 5s. 10½d. On the obverse is the Imperial coat of arms, and on the reverse that of the mint-master.

The silver coinage comprises four denominations, the first or largest being of the same shape as its richer neighbour, the Ko-ban, but larger. Its length is 3 in., and its width 1⅜ in. It is called the Ita-kane, which, being interpreted, means plate-metal, a most appropriate term. The Ita-kane weighs on an average 1,160 English troy grains; its standard is $\frac{236}{288}$, and its value about 12s. It is decorated with the Imperial arms at both ends, and has its weight, value, &c., stamped in the centre. The reverse side is quite plain. The second-sized silver coin is oblong, with square ends, and its weight is 150 grains. The Chinese words *i fun*, which means *a part*, form the obverse, the reverse being a plain surface. The third and fourth silver coins are oblong also, with square ends, and they are decorated with Chinese characters, which we are unable to arrive at the meaning of. Their respective weights are 37½, and 30 troy grains. The practice of stamping the mint-master's name upon the Japanese coins is singular. During the Saxon heptarchy, however, and even for some time after the absorption of the Heptarchic kingdoms into one State, it was the custom to imprint a moneyer's name upon English coins, in token of their genuineness, so that we need not laugh at the habit of our primitive friends who, like ourselves, may relinquish it some day.

RAILWAYS IN BRITISH INDIA.

The railways of India are being proceeded with, in spite of many engineering and other difficulties, with a speed which is worthy of all commendation, and which reflects the highest credit on the various English engineers and their assistants engaged in the work. Mr. Danvers, the Government Director in England, has recently issued his official report of progress made in 1861, but as many miles have been opened for traffic in the nine months which have elapsed since the 1st of January last, we shall take the liberty of giving our readers, in a tabular form, the probable mileage of the various Indian railways which will be in operation on the 1st of January, 1863:—

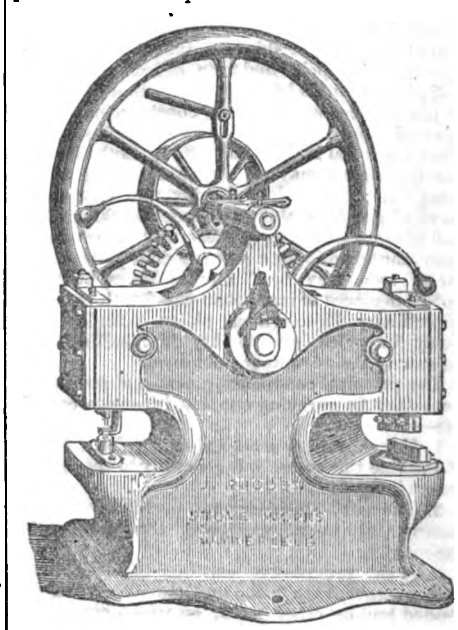
Name of Railway.	Total Length. Miles.	Open on 1st Jan., 1862. Miles.	Additionally Open 1st Jan. 1863. Miles.	Remaining to be completed on Jan. 1st, 1863.
East Indian	1,364	563	496	From Benares to Allahabad and Jubbulpore.
G. I. Peninsula..	1,266	437	219	From Sholapore to Bellary, on Madras side; Julgaom to Nagpore, on the south side, Jubbulpore on north side.
Madras	850	298¾	150	From Arconum to Bellary, and the Bungalore & Neilgherry Branches.
Bombay and Baroda	310	132½	117½	Sixty Miles.
Sinde	114	114	—	—
Punjaub...........	252	—	45	—
Punjaub and Delhi	280	—	—	From Lahore to Moultan.
East Bengal	110	—	110	To be finished in 1866.
Great Southern..	78½	—	78½	—
Calcutta & S. E.	29	—	29	—
Total	4,653½	1,545¼	1,245	1862¼.

Of these 1,862¼ miles, 520 will be opened by the end of 1863; 730 more at the end of 1864; and the rest, embracing the Jubbulpore and the Delhi and Lahore lines, in 1865 and 1866. When we consider the spaces traversed, the obstacles overcome, the distance of India from England, the exposure of English engineers to a hostile climate, and the occurrence of a rebellion in the midst of the work, it is impossible to withhold admiration from the men who, in a comparatively short space of time, have done so much. Before many years elapse it will be possible for a passenger, almost without changing carriages, to go by rail from Kurrachee to Calcutta, thence to Bombay, thence to Madras, and thence to Trichonopoly or Beypore, thus crossing the continent three times with only one break from Kotree to Moultan on the Indus!

Truly this is progress indeed, and the only source of regret in connection therewith is that many, very many, valuable lives have already been, and many more doubtless will be, sacrificed in effecting it.

RHODES' PUNCHING AND SHEARING MACHINE.

The annexed is a sketch of a small punching and shearing machine, exhibited by Mr. Joseph Rhodes, of the Grove Works, Wakefield, in the International Exhibition. It is intended for either hand or steam-power. It shears up to ⅝-in. plate, and it punches up to ¾-in. holes in ½-in. plate. The shears are placed at an angle for bar-cutting, and they take in up to 7 in. from their edges. The punch will take in plate 9 in. from centre.



The pullies or the handle on the fly-wheel, work a pinion driving a large-toothed wheel, on the shaft of which wheel are two eccentrics, each eccentric working a lever on a fulcrum, as shown. The other ends of the levers work the square slides up and down, for either punching or shearing. Either slide can be thrown in or out of gear.

HARBOURS OF REFUGE.

Since our recent article has appeared upon the necessity of constructing additional Harbours of Refuge in this country, our attention has been drawn to a breakwater, invented by Mr. W. Bennett Hays, engineer. One of them was executed some few years ago for the Government of South Australia, but, from unexpected difficulties, arising from the rocky nature of the soil, it has not yet been erected.

It will be constructed in bays of 20 feet, supported on cast-iron screw piles, the platforms being ⅜-inch boiler plate, put together with ⊥ irons on the upper side, riveted on in a transverse direction, and Barlow's rail, inverted, and riveted longitudinally as bearers on the under side, and further stiffened by pipes and bolts connecting the plates together in the middle of their length. The plates will be carried upon frames of bar-iron, 6″ by ¾″, riveted together with cross and diagonal pieces, each plate having a 3½-inch angle-iron on its end by which it will be bolted to the frames, and be supported by small cast-iron brackets, also bolted to the frames. The frames themselves, when in their places, will be bolted to one another, and will rest upon step castings attached to the piles, and be connected to the piles by wrought-iron clips and links. The breakwater will be arranged in the form of a crescent, presented towards the point of the prevailing winds, and is 240 feet in length.—*Building News.*

The Art Union of Glasgow have this year decided to issue, instead of the usual engraving, three photographs of works of art.

Correspondence.

[*We do not hold ourselves responsible for the opinions of our Correspondents.*]

LONDON BRIDGES INVERTED.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Sir,—The article on the London bridges, extracted from the *Building News*, I have read with some degree of interest, having devoted several years of persevering determination to the subject of embanking the Thames on *both sides*, from Chelsea to the Nore.

I had my attention early directed to the probability of weakening the bridge-piers and arches (by deepening the scour of the stream) when both sides of the river were finally embanked. But I saw an immediate remedy for suggested probable evil. In looking at the reflected bridge, on a bright day, I

noticed the reflection of the bridge in the water, and I considered it gave a capital notion of how to build bridges *for endurance* by constructing inverted arches, as shown by dotted lines of the reflected bridge which would give immense strength and resistance to scour of stream.

Yours respectfully,
W. Austin, C.E.

31, Hamilton-terrace, Milford, South Wales,
Oct. 11, 1862.

DEFLECTING ARMOUR PLATES.

Sir,—Will you kindly permit me to reply to the letter of your correspondent, Mr. St. John Vincent Day, that appeared in your valuable paper of the 17th ult. That gentleman appears not to be aware of the extreme difficulty of applying deflective armour to sea-going ships of war. If he would sketch or draw out a complete section of a ship with the construction he proposes on each side he would see immediately the impracticability of it.

The muzzles of the guns should of course be capable of being projected beyond the port sills. To secure this the deck upon which they stand would have to be projected into his wedge-formed shields, making the breadth of the ship at that part 15 ft., or more than the breadth at the line of flotation.

Mr. Joshua Jones, of Liverpool, who patented the form proposed by Mr. Day in 1859 (No. 2,391), dropt the point of the wedge to the line of flotation, producing the celebrated iron angulated ship which has caused so much discussion, and which is really the parent of the whole of the American and other vessels of similar description.

The angulated ship, after considerable hesitation, appears not to have found favour with our admiralty. The late General Sir Howard Douglas thus remarks upon it:—"From the falling in of the sides, to the extent of 45 deg. to 50 deg., the breath of the gun-deck upon an angulated iron-sided vessel is so much reduced as to be incapable of receiving and working her guns; the vessel would be washed over by a heavy sea; could have no rigging, on account of the deflection of the shot striking the angulated sides, and from the same cause would imperil those she was intended to defend."

The conical shields I proposed was an endeavour to remedy these faults. To apply deflective armour to an upright-sided ship, and to lessen the weight and thickness of iron usually required, I considered that while to the power of the gun there was no stop, to the thickness of the iron-plating there was a limit. That while it was an impossibility to render wholly impenetrable an upright iron side of a ship, the projecting the armour in the form of cones might permit a thickness of only 3 in. to be used, allowing a thickness of 10 or 12 in. for the weaker portions of the shield, the flatter parts, which Mr. Day so rightly considers would not deflect shot.

Already the 4½ inches of iron is found to be too weak, and a greater thickness is spoken of, rendering it absolutely necessary for some contrivance like the conical shields to be adopted, for it is admitted that much less resistance is required to be opposed by angulated plates in order to do the same or even more work than vertical ones.

The effect of the square-headed shot on the shields would, I expect, be very serious, but it would not be so damaging as it would be against a flat side of only 4½ in. thickness. It would rip up one and smash through the other.

Thanking Mr. Day for the notice he has taken of my deflective shields, and freely admitting that there is an Achilles heel to all such inventions, I assert that they are the only form of deflective armour that can be applied to sea-going vessels of war.

34, Kensington-square, I am, &c.,
20th October, 1862. C. J. Richardson.

MARINE ENGINE MAKERS.

Sir,—I observed in last week's edition of a contemporary, some remarks on the construction of marine engines in the Exhibition. The profound writer, after passing by the pickle and the toy trophies, with a look of disdain, proceeds to pass his judgment on the marine engines contained in the Western Annexe. After eulogising the work of all the great makers, and comparing the prices, he proceeds one by one to pull them to pieces. He advises Mr. Lloyd to offer £60 per horse-power for the best screw engines that can be had on the Clyde, Tyne, or Tees, and tells him that the London firms would be put to their "mettle" to produce work so good, which would be the means of giving all the trade to one spot, the very grievance Government has been trying to remedy by distributing their work fairly among the great manufacturers of the kingdom. He proceeds to find fault with the engines of Messrs. Maudslay, Sons, and Field, and gives great praise to those of Messrs. Penn. I have noticed that the said journal has always given great praise to all work manufactured by the latter firm, and has generally found some fault with the Messrs. Maudslay's productions. If the writer of that article should happen to be acquainted with any of Her Majesty's marine engineers, would he mind putting the following questions to them:—Which engines would they rather work or drive? Which engines require the most attention, and get heated soonest? Which engines consume the most oil and fuel, and soonest get out of repair? If he would ask these questions, he would find that Maudslay's engines require little or no attention when once started and the lubricators supplied. That the trunk engines of Messrs. Penn consume some gallons of oil per day more than those of Messrs. Maudslay, and a much larger amount of fuel. The trunks of Messrs. Penn's engines, if once allowed to run short of oil, in a few minutes will get so hot that the engineers have been known to pour water on them. The writer of the said article is perfectly correct in one sense in saying there is such a thing as too good work, for I do not think that the engines made by Messrs. Maudslay cost the Government much for repairs after the first payment. In speaking of the short connecting rods of the engines of Messrs. Humphrey, that able writer may have overlooked the fact that it is possible to make connecting rods a trifle too short. But he follows the path of most critics, finding fault where there is scarcely any fault to be found, and turning mole hills into mountains; if he could or would offer some advice that would tend to develop the subject which he is criticising, he would deserve and obtain the thanks of those particularly interested in the question. Hoping you will give this publicity, as I believe it to be the truth.

Yours truly,
Henry S. Jendrzejowski.

1, Union-street, London-road, Southwark, S.

Gossip.

It appears that the great company of the *Voitures de Paris* has been discussing with the police authorities the adoption of payment by distance instead of by the drive—and that a competition has been opened for what is called a "kilometrical reckoning apparatus," which while enabling the public to know exactly what is the driver's due, will also protect the cab proprietors from embezzlement on the part of their men. At a meeting of the shareholders held in August the director of the company announced that, notwithstanding many difficulties, a suitable apparatus was likely to be at last hit upon. No less than 148 instruments and several hundred projects had been sent in for approval. The adoption of the simplest and most practical of these would remove the great objection there now is to payment by distance—namely, the continual disputes it gives rise to between hirers and drivers. In this matter of cabs and cab-drivers, so important to the comfort and even to the safety of the public, the new London company may take some valuable hints from the one already long established in Paris, where it is certain that the carriages are generally better and the coachman more respectable than is the case in our own capital.

The following is an enumeration of the extensive network of railways in Italy, conceded to M. Bastoggi:—1. A grand line starting from Ancona, skirting the Adriatic and serving Pescara, Termoli, Foggia, Barietta, Bari, Brindisi, and Lecca, with a branch from Bari to Taranto, on the Ionian Sea, which together will form an extent of 740 kilometres, or 468 English miles. 2. A branch line from Foggia, passing from Ascoli, Causa, and Eboli, as far as Salerno, where it joins the line already constructed to Naples. Length about 181 kilometres, or 113 miles. 3. A branch line starting from Ceprano (where it meets the line already constructed from Rome to Naples) by Sora, Celano, Sulmona, and Popoli to Pescara, about 231 kilometres, or 145 miles. 4. A branch of 28 kilometres, or 17½ miles from Voghera to Pavia; and 5. Another branch of 167 kilometres, or 104 miles, from Pavia to Brescia, passing by Cremona. As to this branch, however, the Lombard and the Central of Italy Company claim a right of preference by reason of a previous concession. The extent of the lines to be constructed is 1,357 kilometres, or about 848 miles.

A new and large blast-furnace was blown in last week at the Consett Ironworks, Newcastle-on-Tyne. It was charged with 104 tons of coke, and 119 tons of minerals; and when it was tapped the yield was satisfactory beyond expectation. The size is nearly three times that of ordinary furnaces, and when in active operation the proprietors expect to derive 400 tons of metals per week from it.

A letter from Clermont (France), of the 13th inst., says:—"Two afternoons back a waterspout burst over the commune of Brignac, in the canton of Clermont-l'Hérault. In less than ten minutes the plain of Salamane was transformed into an extensive lake, the waters rising to a height of more than a metre. The carts occupied in the village had great difficulty in returning to the village. Happily no accident occurred. Several persons, surprised by the fall of this diluvian torrent, were compelled to take refuge in trees, and upon the walls which border the roads and private properties. Within the memory of man no such event had taken place in the neighbourhood, consequently all the inhabitants of the commune assembled after the storm, on the road from Brignac to Clermont, to discuss the effects of the waterspout, which may be considered as a really remarkable phenomenon."

It is frequently stated by those who wish to create panics, as an excuse for extravagant expenditure, that large works are being carried on secretly in the French dockyards. Nothing is more notorious, however, than that one government of Europe knows what all the other governments are doing. As a proof of this—Admiral Robinson, of the British navy, has just arrived at Toulon to examine the system employed in that port in the construction of iron-coated ships of war. The admiral has visited the principal dockyards in Europe for the same purpose.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

The Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the Proprietors of this Magazine. Other Papers are hereby warned not to produce them without an acknowledgement:—

FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 846, 864, 870, 881, 885, 889, 901, 905, 907, 912.
METALS, including apparatus for their manufacture, 848, 874, 910, 913, 919.
CHEMISTRY AND PHOTOGRAPHY, 878, 880.
ELECTRICAL APPARATUS none.
WARFARE, 872, 873, 895, 898.
LETTER-PRESS PRINTING, 915.
MISCELLANEOUS, 847, 854, 855, 857, 859, 861, 862, 871, 877, 883, 890, 892, 894, 896, 903, 917, 920, 921, 922, 926.

846. T. G. GREENSTREET. *Improvements in window sashes.* Dated March 27, 1862.

Here the inventor forms each side of the framework of two pieces or strips of wood or other material, one of which is fixed to the top and bottom sides of the sash at each side thereof, and the two other pieces are loosely connected to the fixed pieces, each by a screw, which serves as a pivot on which to turn the sash inside out for cleaning or repairs. The aforesaid loose pieces fit into the window frame in which the sashes slide, and are connected by lines to sash weights. In order to keep the sash air-tight, he forms a groove in the edge of the loose pieces aforesaid, and also in the edge of each of the fixed side pieces of the sash. He also forms a groove in the bottom edge of the bottom rail of the bottom sash, into which he places a strip of vulcanized india-rubber, long enough without stretching to reach up to the top of the sash, in the grooves of which it fits at each side, as also in the grooves in the loose pieces before named. He also fixes a piece of metal to each end of the india-rubber, by pulling which the india-rubber will be stretched and withdrawn from the grooves in the loose pieces aforesaid, and may be held in this position by inserting the aforesaid pieces of metal into holes formed in the top rail of the bottom sash and the bottom rail of the top sash. The window can then be turned inside out on its pivots. He also inserts and fixes a strip of vulcanized india-rubber in a groove formed in the top or bottom sash for the purpose of excluding the air or dust. *Patent abandoned.*

847. F. TOLHAUSEN. *New or improved cigar tubes or apparatus for holding and smoking cigars and cigarettes.* Dated March 27, 1852.

This invention is not described apart from the drawings. *Patent completed.*

848. R. EDWARDS. *Improvements in machinery and apparatus for pulverizing, stamping, and washing mineral, animal, and vegetable substances.* Dated March 27, 1862.

This relates, primarily, to the application of a circular inclined surface for raising the hammers, stampers or beetles; and secondly, to the general arrangement of the parts of machines used for these purposes, as hereinafter described. For grinding quartz, emery, and other ores, the patentee uses an annular trough to receive the material to be operated upon, and the stampers, which are arranged in a circle, and are mounted on levers radiating towards the centre; these are cranked downwards, and dip in a basin, within which the levers and hammers are mounted on centre point bearings, which basin is filled with oil to lubricate the parts. A vertical shaft is disposed in the centre, carrying the circular incline, placed immediately above the short ends of the levers, which are furnished with contact points or friction rollers. This shaft is rotated by wheel gearing, and as it carries round the incline, it acts on the whole of the levers, so as to raise them gradually and continuously, and allowing them to drop one at a time on the matters to be operated on; or there may be two, three, or more inclines in the circle, and two, three, or more stampers allowed to drop at same time. *Patent completed.*

849. W. F. HENSON and H. H. HENSON. *Improvements in wicks for candles and lamps.* Dated March 27, 1862.

This consists in the manufacture, use, and application of paper wicks, or wicks composed of paper, papier maché, and other suitable materials combined therewith for candles and lamps. *Patent abandoned.*

850. J. LOCK. *Improvements in apparatus for raising or elevating straw and crops on to stacks.* Dated March 27, 1862.

Here the inventor uses a framework or carriage, by preference mounted on wheels, and fitted with shafts, so that it may readily be moved from place to place by a horse. This carriage has a long and narrow rectangular frame mounted on it, the frame being connected at one end with an axis having its bearings on the carriage, so that by turning the frame about its axis its further end may be raised to any desired height from the ground, and there is suitable apparatus to retain it in any desired position. This frame carries the bearings of a series of rollers or drums, placed parallel the one to the other, and at a short distance apart. The rollers or drums are furnished with projections or teeth, and are all caused to revolve by arms and rods or other instruments connecting them with an axis which is driven by a steam engine or other means. When the apparatus is at work, the outer end of the roller or drum frame is raised to the required extent, according to the height of the stack, and the straw or crop being presented to the lowest roller or drum of the series is taken by the projections or teeth thereon, and carried forward to the next roller or drum, which then takes it, and in this way the straw or crop is carried forward and elevated until delivered on to the stack. *Patent abandoned.*

851. E. H. C. MONCKTON. *Improvements in the manufacture of effervescing liquids.* Dated March 27, 1862.

This consists in combining with effervescing drinks, spirits, brandy, wines, liqueurs, or other flavourings. *Patent abandoned.*

852. J. L. H. C. COUNTESS DE VERNEDE DE CORNEILLAN. *Improvements in treating open cocoons of silkworms, and in converting the waste resulting therefrom into paper.* Dated March 27, 1862.

This invention consists in a particular treatment of cocoons naturally open, or with an orifice made by the chrysalis, and in the cottonizing and transforming into paper the waste resulting therefrom. The first part of the invention relates to the decortication and the drawing out of raw silk from the cocoons naturally open, of the *Bombix* and of all other species, with an orifice opened by the chrysalis passing into the moth or butterfly state. To decorticate the cocoons of the "*Cynthia de l'ailanthe,*" the inventress uses a small instrument with movable spatulas; the cocoons are then plunged into a boiling soapy solution, where they remain from fifteen to twenty minutes, then into boiling water to which a volatile alkali has been added; the water is stirred, the vessel containing the liquid and other matters is closed, and after the expiration of a few minutes disaggregation is perfect, and the drawing off may be effected. The cocoons are removed from the vessel and are placed in a shallow sieve with large meshes immersed in a vessel full of boiling water. The sieve is raised completely out of the water, and the cocoons are allowed to drain, and she then winds off from the cocoons while damp and quite out of the water. To draw easily several threads at one time, the sieve may be divided into compartments to prevent the mixing of the threads. She winds off with equal facility from cocoons from which the chrysalis has escaped, the weight of the water which fills them being equivalent to that of the chrysalis. The disaggregation of the Ricin cocoons ("*Bombix Arrindia du Ricin*") is effected in a few minutes; they need only be decorticated after the boiling. One boiling water, or one boiling water slightly soapy is sufficient. We cannot give space to the whole of the details of the invention. *Patent completed.*

853. R. A. BROOMAN. *Improvements in machinery for preparing, combing, and dressing vegetable fibres.* (A communication.) Dated March 27, 1862.

This invention consists, first, in the employment in machinery for preparing, combing, and dressing vegetable fibres, of endless chains passed and extended round drums or cylinders. The transverse links or bars of the chains are plain and serrated on their surface, so that they act as combs and beaters or scrapers; one serrated edge and two plain are preferred alternately. The chains are placed in pairs, one above another, and the drums or cylinders are supported in strong bearings, and have motion communicated to them from any prime mover. The invention consists, second, in the employment of an endless chain for conveying the material to be operated upon to the machine. It is extended round two shafts, and has motion imparted to it through a pinion on one of the drum shafts through another toothed wheel and a pulley and strap on one of the shafts round which the endless chain passes. A gripper connected to this chain holds the material while the beaters or scrapers and combs act upon and dress the fibres. The machine is constructed in such manner that the axles may be prolonged, or the frame be brought out at the side, so as to enable the gripper to draw out the combed fibres at the side of the machine. Instead of two sets of endless beaters or scrapers and combs, in some cases one set only is used. *Patent abandoned.*

854. R. DE BARY. *Improvements in machinery for the manufacture of cigars.* (A communication.) Dated March 27, 1862.

This invention consists in certain improvements on a former invention, for which letters patent were granted to the present patentee, 1st November, 1859, No. 2,493. The mechanism then described for causing the rise and fall of the knife is here replaced by *two eccentrics*. The tobacco, on leaving the box or case by which it is fed to the machine, is guided to the knife, cut, compressed, and carried on to a band stretched over a curved plate or sector, free to oscillate about a fixed point. There is a space or pocket formed in the band into which the cut tobacco falls, and wherein it is pressed by a plunger; a roller advances, folds the band over the tobacco, and the curved plate moving at the same time, carries on the cigar thus partially manufactured with it. To regulate the thickness of the cigar, a roller is placed above the band, which consolidates the tobacco as it passes under it. The envelopes or outer skins for the cigars are led up by an endless band which, through two guides, the lower of which revolves, causes the envelope to be wound round the cigar. Motion is communicated to the endless band by a drum or cylinder ronnd which it is passed. There is a toothed wheel on the drum shaft in connection with a ratchet, having a curved arm or branch proceeding from it bearing against a small roller beneath, by the action of which the motion of the drum and band may be regulated or stopped. The toothed wheel before mentioned, through a cranked and connecting rod, communicates motion to the curved plate, which is in unison with that communicated by the drum to the endless band. As the curved plate oscillates it carries the cigars down with it, and deposits them into compartments formed in an endless chain into boxes, or into any other convenient receptacle. *Patent completed.*

855. J. EASTERBROOK and J. H. ALLCARD. *Improvements in vices.* Dated March 27, 1862.

The objects of this invention are, first, to render the bench vice more effectual in its operation by causing the movable jaw to move, as hereafter described, in a straight line parallel to the direction of the action of the screw, instead of in a circular arc, as heretofore; second, to render vices more effectual for gripping taper articles. The improvements are effected in combination with the ordinary vice box and screw, with either solid or brazed threads in brass, copper, wrought iron, annealed malleable cast iron, or any other metal or combination of metals that may be found most convenient and useful, or the thread may be cut in the fixed jaw. The movable jaw in the parallel vice is steadied and guided in its movements by a metal bar working and bearing upon a suitable plate fixed below the screw and box at any suitable distance. The plate for fixing the vice to the bench bears, by preference, upon the bench or under the bench, assisted in some cases by a leg reaching to the floor, welded, screwed, or otherwise fixed to the slide plate, or to either of the jaws whenever found necessary for the proper securing and supporting of the vice. In some cases the inventors make the parallel vice self-adjusting for gripping cotters or other taper work by means of a swivel or joint formed in either one of the jaws. The swivelling jaw is compensated by spherical washers placed upon the screw or box in order to secure at all times a proper bearing for the screw upon the jaws. The movable jaw may be connected to the screw in many ways, in order to cause the said screw to carry the jaw with it in all its motions. *Patent abandoned.*

856. W. E. GEDGE. *Improvements in apparatus for extinguishing fire.* (A communication.) Dated March 27, 1862.

This invention is not described apart from the drawings. *Patent completed.*

857. S. A. EMERY. *Improvements in the manufacture of soap.* Dated March 27, 1862.

This consists in combining with the saponaceous materials usually used in the manufacture of soap, woody fibre reduced to a finely-divided or pulverized state. *Patent abandoned.*

858. J. H. JOHNSON. *Improvements in thrashing machines.* (A communication.) Dated March 27, 1862.

This consists, essentially, first, in the use of two separate and distinct beaters or drums, placed side by side, parallel to each other, and each supplied from a separate feeding board or table of its own. The extra table for the second drum, or set of beaters, is made to fold down when the machine is being transported, against the end thereof, and held in that position by suitable hooks or catches, so as to occupy less space; second, in the use of an elevator for raising the winnowed grain up to the level of the sack's mouth, thus obviating the necessity of having a high machine; third, in applying a series of hooks or serrated plates to the surface of the shaker, for preventing the straw from returning and choking the beaters. *Patent abandoned.*

859. W. F. SMITH and A. COVENTRY. *Improvements in and applicable to lathes and machines for turning and for cutting screws.* Dated March 27, 1862.

This invention is not described apart from the drawings. *Patent completed.*

860. G. H. BIRKBECK. *Improvements in the means of producing imitation mosaics.* (A communication.) Dated March 27, 1862.

Here the model of the design is first executed on paper, and coloured, to give an idea of the general effect ultimately required. This model design is cut into sections of the various parts of the design. These several sections, composing the picture or other work of art, are then placed separately on plates or surfaces of baked or unbaked earthenware, metal, or other substance suitable for enamelling upon, which is then cut or shaped to the exact contour or shape of the particular part of the design under treatment. When all the parts are thus arranged they are placed together to ascertain if they fit correctly, so as to represent the original design. The various parts are then covered with enamel, either separately or combined, the enamel being so applied to each part as to produce, when "fired" or baked, the various colours required in the complete design. When baked the parts are combined and cemented or secured together in any convenient way. *Patent completed.*

861. G. ALLCROFT. *Improvements in pressure and vacuum-gauges.* Dated March 28, 1862.

An important feature in this invention is the substitution, in place of a metal spring, of a piece of vulcanized india-rubber, sufficiently thick to resist great pressure, or variations of pressure, acting in combination with certain mechanism, the details of which we cannot here devote space to. *Patent abandoned.*

862. J. JONES. *Improvements in apparatus for raising and forcing liquids.* Dated March 28, 1862.

This consists in raising and forcing liquids by a piston and cylinder, which is closed at the top, and provided with a stuffing box for the passage of the piston rod, which is acted on by a screw or other equivalent, for regulating the position of the piston in the cylinder. The lower end of the cylinder is either entirely open, or furnished with a lid, having an opening for the pipe through which the liquid to be raised enters the cylinder; the piston is brought down in the cylinder till it bears upon the liquid, which is then forced up a pipe in communication with the cylinder, and elevated to the required level by the force of the ascending liquid, or by the action of the piston. The piston is provided with valves to allow the liquid in the upper part of the cylinder to pass when the piston is being raised. *Patent abandoned.*

863. W. A. ASHE. *An improved mode of apparatus for driving the propelling shaft of ships or vessels.* (A communication.) Dated March 28, 1862.

This consists in a method of imparting a rotary motion to the shaft of a screw propeller or other shaft without the use of a crank, connecting rod, driving band, or toothed gearing. *Patent completed.*

864. W. B. NATION. *Improvements in manufacturing boxes or cases, and in the machinery or apparatus employed therein.* Dated March 28, 1862.

Here the patentee uses a block or mandril of wood having its transverse section of the same shape as the external casing of the boxes or cases required to be made. This block is covered with one or more layers of paper, strengthened by gelatine, mixed in about equal proportions with carbonate or salts of lime, aluminous, or silicious substances; or he uses silicates of potash or other alkalies, without the aid of gelatine, which substances are coloured in any way. The covered blocks are now passed through a drying chamber by endless bands or chains, and when the material is sufficiently dried, it is removed from the wood and cut into the proper lengths by a circular saw, which operation completes the exterior of the box or case. For forming the interior of the box he uses another block, and covers it with one or more layers of paper, strengthened as before described. The block is of such dimensions that, when the material is divided longitudinally into two parts, each of the parts may pass in the inside of the external casing, and when the internal part has end pieces affixed to it, the box is complete; it can be ornamented in any desired way. *Patent completed.*

865. R. A. OWEN. *Improvements in feathering and varying the pitch of screw propellers for steam ships.* Dated March 28, 1862.

The patentee claims, first, the use of rods passing from the

propeller through the stern pipe, stuffing box, or gland, and revolving with the propeller shaft, for communicating motion from the engine department to the feathering and locking gear; second, the use of the cylinder working fore and aft inside the boss of the propeller, and on the propeller shaft, and the rack and pinion, which communicate the motion from the cylinder to the blades; third, the locking gear for fastening the blades in their several positions, and the use of the split nuts or bushes for securing the blades in their places without weakening them, by key-ways or slots; and, also, the collar on the blade spindle with the recesses, or holes for the lock to ent r; fourth, the use of the collar or flange on the propeller shaft when used to insert screws for the working backwards and forwards of rods used for feathering or locking the blades; lastly, using the propeller boss cut in halves at right angles to the propeller shaft, for the purpose of inserting the blades. *Patent completed.*

866. E. T. MONALHIER. *An improved ventilator.* Dated March 28, 1862.

This ventilator is essentially composed of two hollow and concentric cylinders of sheet iron or zinc. These two cylinders are in their entire length separated from each other by a small circular space, which leaves a free passage for the air. The inner cylinder represents but the continuation of the chimney-flue; it terminates at about the middle of the length of the exterior cylinder in which it is contained. This latter is completely closed at the extremity which corresponds with the lower extremity of the inner cylinder, and contrary to which it is immovable; it will pivot with the greatest facility around its congener when the slightest rotary motion is given to it. Further, it presents on one of its faces a large open throat, and upon its opposite face a species of wing, which forces this throat always opposite the wind. *Patent completed.*

867. A. LUCETTI. *Improvements in apparatus for expressing the juice from pulpy fruit.* Dated March 28, 1862.

This consists in the use of a pair of jaws, the lower hinged to the upper, which works on a fixed centre, and is acted on by a lever handle which, when depressed, causes it to press the fruit upon the lower jaw. The inner surfaces of these jaws may be made more or less roughened, grooved, or corrugated, and the expressed juice is received into an inclined spout which directs it into any convenient receptacle. A spring is applied for the purpose of opening the jaws on the release of the pressing handle. The entire apparatus is proposed to be mounted upon a vertical standard, which is fixed into a table or other convenient support. *Patent abandoned.*

868. J. H. JOHNSON. *Improvements in chaff-cutters.* (A communication.) Dated March 28, 1862.

The variation in the length of the chaff is, according to this invention, effected by having a movable pinion fitted on to the end of the driving shaft, which is changed for a larger or smaller one, according to the size of chaff required. This pinion gears into an intermediate wheel, which drives a third spur-wheel. On the axis of this last-named wheel is a bevel pinion, which drives a transverse shaft, from which the motion is transmitted to the two feed rollers. The upper roller is capable of adjustment to or from the surface of the lower one, and both rollers are driven by bevel pinions carried by a vertical shaft, which derives its motion from the transverse shaft. In order to allow of the adjustment of the upper roller, the pinion which drives it is capable of sliding along the vertical shaft, which may be made of a square section. With a view to prevent the choking of the machine, and to regulate the supply of straw, it is proposed to use a cover or hood placed over the upper roller. *Patent abandoned.*

869. E. SMITH. *Improvements in wet gas-meters.* Dated March 28, 1862.

This invention is not described apart from the drawings. *Patent completed.*

870. R. LUBLINSKI. *An improved method of jointing crutch hooks, or umbrellas, or walking canes.* Dated March 28, 1862.

The patentee makes a plug of hard wood or metal, which he inserts in the hollow at the top of the cane, which plug, being first made quite fast inside the cane, a portion thereof protrudes upwards, so as to fit in a receptacle made in the crutch hook or handle to receive the top of such plug, while an iron or steel peg shall pass horizontally through a part of the hook or handle from the back, and also through the portion of the plug protruding upwards, thereby securely fastening the hook or handle to the cane or stick. He fills in or covers over the hole made in the back portion of the handle for the passage of the metal peg with a piece of the same cane, or any other material as fancy may dictate. He grooves out a portion of the top of the cane or stick, which will allow the hook or handle to drop or fit in, while the sides of the groove will grip or clutch the hook or handle. *Patent completed.*

871. R. KAY. *Certain improvements in printing calicoes and other surfaces, and in apparatus connected therewith.* Dated March 29, 1862.

This consists of an internal cylinder, having an external covering of india-rubber, or other elastic substance, so as to form a cavity or chamber between the two, which cavity is to be supplied by tubes with water or other liquid from a cistern, and the pressure duly regulated by valves; the surface of the india-rubber may either be corrugated or covered with woollen or other fabric. By the rise of the confined water for the color cylinder or sieve, a more yielding or compensating bed is formed at the point of contact with the printing or type cylinder. *Patent abandoned.*

872. J. BOUCHER. *Improvements in rifle ordnance and fire-arms, and in the projectiles to be used therewith.* Dated March 29, 1862.

Here the patentee makes the grooves extremely shallow and concave, the edges merging gradually into the original cylinder of the bore, so that there are no sharp angles whatever at the sides of the grooves. He also makes the grooves shallower at the breech than they are at the muzzle, so that there is no windage. The projectiles are formed polyganally, or many-sided, not so as to fit into the grooves, but having a greater number of sides than the number of lands and grooves in the barrel, the number of such sides being so proportioned to the number of lands and grooves that the projectile cannot be placed incorrectly in the barrel while loading, even in the dark. *Patent completed.*

873. Y. PARFREY. *Improvements in breech-loading fire-arms.* Dated March 29, 1862.

This invention is not described apart from the drawings. *Patent abandoned.*

874. W. CLARKE. *Improvements in apparatus for casting.* Dated March 29, 1862.

Provisional protection has not been granted for this invention.

875. J. MORRIS. *A new or improved machine for breaking up or cultivating land.* Dated March 29, 1862.

This consists of a machine so constructed that when in motion a series of forks or prongs, having an advancing horizontal motion, are made to enter the land to the depth of several inches, and afterwards rise therefrom, the said forks or prongs performing a nearly circular motion in a vertical plane. *Patent completed.*

876. C. H. TOWNSEND, J. YOUNG and J. HAWKINS. *Removing and preventing incrustation in steam-boilers.* Dated March 29, 1862.

This consists in the use of valonia, sumach, and potash. *Patent abandoned.*

877. W. SMITH. *An improved fire-engine.* Dated March 29, 1862.

Provisional protection has not been granted for this invention.

878. W. GLASS. *Improvements in the treatment of sulphuret of antimony, and in obtaining products therefrom.* Dated March 29, 1862.

Here the inventor takes any of the well-known black sulphurets of antimony, called antimony ores, or the refined or called crude antimony, and places it, with or without additional sulphur, in a crucible or other convenient covered or close vessel, in a furnace, and heats it or them to redness in a melted or fluid state, and forces upon or into it or them atmospheric air or oxygen gas, provision being made in the crucible or other vessel for the ingress of air or oxygen, and for the egress of the vaporous products of combustion, viz.:—oxide of antimony and sulphurous acid, which are conducted into tubes, flues, or chambers, where the oxide of antimony is condensed as a fine white powder, and the sulphurous acid may be used as such, or it is oxidated or converted into sulphuric acid by oxygen and steam, as is usually practised in vitrol works. *Patent abandoned.*

879. T. COLE. *Improvements in the manufacture of figured ribbons and other textile fabrics.* Dated March 29, 1862.

This invention consists in substituting for the jacquard machine a machine formed of a horizontal barrel or cylinder, with wire studs attached. These studs, in revolving, press on iron bolts which come in contact with hooked rods, and press the same to the griff, and the griff raises the rods to form the figure on the ribbon. Sometimes the inventor uses slats with wire studs, attached or not to the cylinder, and instead of a cylinder a piece of wood of square or octagon shape may be used. *Patent completed.*

880. W. PATERSON. *Improvements in the manufacture of iodine.* Dated March 29, 1862.

The patentee claims the system or mode of manufacturing iodine, in which the residual still liquor is utilized and applied to the keep leys for neutralizing and decomposing, or partly so, the salts contained therein, and thereby economize the quantity of sulphuric acid which would otherwise be required. Also the application of the precipitate of the compound solution for the purpose of saturating the free acid contained in the residual still of the iodine manufacture, as described. *Patent completed.*

881. R. SMITH. *Improvements in roller blind apparatus.* Dated March 29, 1862.

This consists in suspending a weighted pulley in the lower double or bight of the cords of such apparatus, which pulley may be confined in a vertical slide to guide it, or it may hang loose. The cord or chain by which the weight is suspended is either passed directly down and through the sole of the window frame, or diverted horizontally by passing under a pulley, thence through the side lining of the window, and over another pulley, and from thence the weight depends and applies the necessary force to impart the tension to the cord desired. A weight is suspended at all times, gives to any contraction of the cord, and also takes up any slack due to expansion, and so keeps a uniform tension on the cord. *Patent abandoned.*

882. J. BAKER. *Improved alimentary preparations.* Dated March 29, 1862.

Here, in preparing a concentrated preparation of beef tea, the inventor reduces the beef by stewing in the ordinary way, and adds to 112 lbs. of the beef about 2 lbs. of Jamaica sarsaparilla; he then strains the beef tea from the fibre, and reduces it again by boiling or stewing until there remains about one-sixth part of the original weight. It is then put in close cases in which it sets. According to the second part of the invention a vegetable extract is prepared from carrageen moss. *Patent abandoned.*

883. E. B. HART. *Improved machinery for cutting cork so as to render the same suitable for stuffing purposes.* (A communication). Dated March 29, 1862.

The patentee claims, first, the knife box or shield described, which retains firmly each knife placed in it, permitting only the point to protrude and operate; second, the application of a circular knife-edged saw, which, being a combination of knife and saw, produces a smooth uniform shaving, as described; third, a self-supplying feeding box, which, by a pull of a ratchet wheel coming in contact with the bar, produces the motion of the grooved cylinders whereby the cork is fed progressively to the action of the knives and saw, as described; fourth, a method of divisional pressure, produced by four or more independent fingers, in connection with india-rubber springs, &c., as described; to each finger is given an independent, and yet to the whole surface there is given a united and even pressure, regardless of any irregularity of the thickness of the cork; and, lastly, he claims the material or fibre produced by the machine in the manner aforesaid, and its application to various useful purposes as specified. *Patent completed.*

884. J. PLATT AND W. RICHARDSON. *Improvements in carding engines.* Dated March 29, 1862.

The patentee claims the use of a second crank or cranks and balancing apparatus as described. *Patent completed.*

885. W. E. NEWTON. *An improved mode of applying acoustic apparatus in churches and other buildings and apartments.* (A communication). Dated March 29, 1852.

This consists of a funnel-shaped receiver, of an elliptical form at its mouth, which fits to an opening in the top of the pulpit and collects the sound. The elliptical funnel-shaped receiver gradually assumes a circular form towards the bottom, where it terminates in a circular throat, from which a pipe runs under the floor to any convenient point, where it is led upwards through the floor to connect with a taper flexible tube, at the end of which is an ear piece to be placed in the ear of the person requiring it to conduct the sound thereto. *Patent abandoned.*

886. J. CLINTOW. *Improvements in flutes.* Dated March 31, 1862.

This consists in making the first, or lower C sharp hole, nearly as large as the diameter of the cylinder; the other holes, up to the twelth, or C natural hole, are gradually reduced in size. *Patent completed.*

887. M. A. F. MENNONS. *The manufacture of glucose, or fermentable sugar, from a vegetable product not hitherto used for that purpose.* (A communication.) Dated March 31, 1862.

This consists, first, in the application of carol beans, or fruit of the carol tree (*ceratonia silicia*), to the production of a species of glucose, or fermentable sugar, adapted to a variety of manufacturing purposes; second, in a certain process, by the aid of which this substance is extracted from the raw material thus applied. *Patent abandoned.*

888. J. JORDAN. *Improvements in the construction of armour-plated vessels or other like structures.* Dated March 31, 1862.

Here the armour plates are composed of a mixture of pig iron and malleable iron, melted together in such proportions as may be found advantageous, and afterwards annealed, and they may be case-hardened. The holes for the bolts may be cast or bored in or through the plates, or nuts of wrought iron may be bedded in the mould, and the metal cast round them; and in this case it is preferred not to form the nuts so deep as the thickness of the plates, so that no holes shall be required through the plates; or the bolts may be screwed into the plate any required distance, but so as not to actually perforate the plates on the outside. The invention further consists in the use of suitable cement placed between the joints of armour plates, and between the armour plates and wood backing, and also between and behind the wood backing. *Patent abandoned.*

889. R. YOUNG. *Improvements in apparatus for cleaning, separating, washing, and drying grain.* Dated March 31, 1862.

This invention is not described apart from the drawings. *Patent completed.*

890. W. FRANKENSTEIN. *The cutting of all kinds of corks, both pointed, conical and cylindrical.* (A communication). Dated March 31, 1862.

This consists in the construction of a machine which cuts corks by hollow, cylindrical, or conical knives being made to pass perpendicularly through cork which has been cut into strips, the strips being as long as they can. The length of the cut corks will correspond with the depth of the strips, and the thickness of the cut corks with the diameter of the hollow knives. An endless band passing over a wheel sets the machine in motion. *Patent abandoned.*

891. W. TYLER. *A new or improved mixture or composition for feeding dogs and other animals and poultry.* Dated March 31, 1862.

This composition consists, essentially, of dried or liquid blood, combined with vegetable or farinaceous matter, either with or without the addition of ground bones, as described. *Patent completed.*

892. W. H. HOOK. *Improvements in folding envelopes and paper, and in machinery or apparatus employed therein.* Dated March 31, 1862.

The patentee uses a skeleton frame of thin metal, or other material, of the required size and shape, and covers the edges thereof, or the sides and edges, with linen, silk, leather, or other absorbent material. To the said skeleton frame he supplies water or other liquid, so that its edges shall be moistened, and then presses the frame on the paper, or presses the paper on the frame, by which operations the absorbed material covering the edges of the frame will moisten or damp the paper in lines corresponding with the edges of the frame, and thereby enable the operation of folding to be greatly facilitated. The pressure is obtained by an ordinary copying or embossing press, lever, or other contrivance, and constant supply of water or other liquid is supplied in any convenient way. *Patent completed.*

893. J. P. WOODBURY. *An improvement in arming war vessels.* (A communication.) Dated March 31, 1862.

This invention relates to a method of arming war vessels, both as regards their means of attack and detence, and is designed, among other things, to enable a vessel to attack and overpower the iron-clad war steamers which are now being built by the naval powers of the world, and at the same time enable them to be constructed and employed at a reasonable cost. The manner in which the patentee proposes to accomplish this object may be stated in general terms to consist, first, in providing a hull of good model for speed, with a shallow draught of water, and of a capacity to carry coals and machinery sufficient to excel in speed any vessel designed to be attacked. Secondly, in providing means for sinking it to the deck by water ballast when going into action, so as to expose the smallest possible part of the ship to an enemy's fire, which part only would require to be plated with thick iron to protect it from shot. Thirdly, in making the deck convex or circular, both longitudinally and transversely, so that, when the vessel is submerged to a fighting trim, the sides of the deck will be

below water, and the surface exposed will be presented to an enemy's shot at a low angle, and also that the centre of the deck will be sufficiently above water to enable the vessel to be worked in a sea way. Fourthly, in forming in the middle of the deck a low oblong trunk projecting upward a short distance from the deck, and plated so as to be secure from shot, through the sides of which small holes are made for the purpose of observation externally, and for the purpose of defending the deck by musketry, by ejecting hot water, or any other means. These holes are flared upon the inside to permit a wider range of observation and attack after the manner of a loop-hole for musketry in fortification. The top of the trunk is provided with several large openings, thoroughly secured by shot-proof gratings, through one of which the smoke from the boiler emerges, and through the others the hold is ventilated by fan-blowers or otherwise. The steering wheel is also placed within it, and from within it all the movements of the vessel are directed. Fifthly, for the purposes of attack, the vessel is provided with, say, three or more breech-loading cannon of large calibre, which are mounted, one at the bow ranging fore and aft, and one on either side ranging athwart ship, the muzzles of which extend through the sides of the hull at a considerable distance (say ten feet more or less) under water, and are provided with many accessory devices to enable the guns to be worked under such conditions. They are designated to carry a large oblong hollow projectile or shell, containing a great bursting charge, which is to be thrown into the hull of the vessel to be attacked, and there exploded by a fuse. The guns are made to work in stuffing boxes in the side of the hull, and have a movement only in a longitudinal direction, and are not designed to be armed, as they are intended to be used only when they are near the object to be assailed. *Patent completed.*

894. W. B. Lord and F. H. Gilbert. *An improved hame slip for suddenly releasing horses and other cattle from their harness, also applicable for releasing heavy bodies or weights.* Dated March 31, 1862.

This hame slip interposes between the hame and trace, and is composed of a piece of metal, having two deep open slots cut in the broad or circular portion thereof. These slots or cuts divide the circular part of the metal into three parts, which may be termed cheeks. A pin-hole is made in the inner and centre pieces or cheeks, and in the outer a key-hole shaped slot. A spindle passes through these holes and works longitudinally therein freely. A groove is cut along the bottom of the spindle, into which a screw takes, the screw being passed through the lower part of the centre cheek, thus preventing the spindle turning entirely round, when it is withdrawn to allow the trace to drop from between the inner and centre cheeks of the slip. Hinged with or into one end of the spindle is a T or other shaped piece serving to pull out the spindle as far as the stop, or push it back in its place, and in conjunction with the slot secure it in position. *Patent completed.*

895. W. B. Lord and F. H. Gilbert. *Improvements in loading fire-arms.* Dated March 31, 1862.

Here the inventors propose to use an apparatus which shall entirely prevent coagulation of the powder on the inside of the barrel. Each Enfield rifle has a screw threaded on the point of the ramrod; they screw on to this point a small piece of metal with open sides, and to this piece hangs a cylinder of capacity to hold the exact charge of powder required to a load. At the bottom of the cylinder, which is partly open, is a mushroom valve, connected by a pin, which passes through the bottom of the cylinder to a deeply-grooved projecting head or ball. The action is as follows: the piece being screwed on to the end of the ramrod, the cylinder is placed on the barrel, where it hangs vertically, the ramrod being in a horizontal position; the charge of powder is then poured into the cylinder, the ramrod raised vertically passes the cylinder down to the breech, the head or ball on touching the bottom pushes up the mushroom valve, and the powder at once escapes through the grooves of the head or ball into the breech. The apparatus is then retired and the loading completed in the usual manner. *Patent abandoned.*

896. R. Burley. *An improved material for forming or lining the bearing of axles and shafts and other rubbing parts of machinery.* Dated March 31, 1862.

Here the patentee employs an alloy, consisting of iron, copper, tin, and zinc, combined with a small quantity of sulphur, and sometimes also of arsenic. *Patent completed.*

897. C. R. Ransome. *Improvements in thrashing and other machinery where corn or grain is required to be raised from one level to another.* Dated March 31, 1862.

This consists essentially in the employment of a revolving wheel or surface, on the periphery, or at a distance from the central axis, of which are applied propellers, buckets, or paddle boards, which work within a chamber of cylindrical form. *Patent completed.*

898. R. Nightingale. *Improvements in markers, butts, or mantelets.* Dated March 31, 1862.

Here the inventor constructs a marker's butt or mantelet, enclosed on all sides, and he makes all parts sufficiently bullet-proof to prevent accident to the markers, whether by the direct action of bullets or portions of bullets, or by their rebound, or by their being deflected by the butt or mantelet, or from any substance struck by a bullet; and in order to enable the markers to ascertain the position where any balls may strike a target, he applies at the upper part of a marker's butt or mantelet a bullet-proof camera, so arranged that it may throw an image of the target on to a table or surface below, on which is placed properly ruled or prepared paper, corresponding with the divided surface of the target, so that the mark made by each bullet in striking the target will be imaged in its precise position on the ruled or divided paper, and be then marked or indicated by the marker with ink or other material, together with the number of shot; and in order to obtain a full record of all the shots, the marker may also register or mark in the margin of the paper all shots which miss the target, together with their numbers, or the order in which such misses have occurred. Inclined or bent passages or tubes are applied, which prevent the passage of light, but admit air and sound freely. *Patent abandoned.*

899. L. B. Schmolle. *Improvements in the construction of crinolines or steel skirts.* Dated March 31, 1862.

The patentee claims constructing steel skirts with series of junctions arranged in lines in the steel strips that permit of bending in a horizontal direction, as described. *Patent completed.*

900. J. Harding. *Improvements in the application of the waste heat arising from coke ovens for heating air for blast furnaces, also for calcining iron, stone, and other minerals, and for heating and smelting iron.* Dated March 31, 1862.

The inventor causes the mouths of a group of coke ovens to open into a flue, in place of into the atmosphere, such flue leading direct either to an ordinary calcining furnace or chamber, or to a smelting furnace or air-heater, according to the purpose for which the spare heat is intended. *Patent abandoned.*

901. J. M. Clements. *Certain improvements in sewing machines for performing the various kinds of work necessary in stitching, button and eyelet-hole working, embroidery, and sewing generally.* Dated March 31, 1862.

In giving effect to this invention the inventor fixes one or more axles, cranked or otherwise, or their equivalents, such as cams, on a suitable bed or cast frame, deriving their motion from a friction pulley or other means at the back of the machine, and which may be worked with a treadle or otherwise as required, the eccentric end of the crank or cranks operating on and regulating the action of the shuttle and levers, elevating the shuttle during the time of its passing through the loops, and bringing it back through an irregular curve below for repeating its former motion. By this arrangement the shuttle is removed while the levers are forming and the hooks taking up the several loops required previous to the shuttle again passing through them. The nose or sharp end of the shuttle will be always kept in one direction by means of a slotted lever working vertically or horizontally. Or, as a modification of this arrangement, and to avoid the necessity of having the two loops round the shuttle at one time, the shuttle may be made sharp pointed at each end, so that in its traversing motion it shall pass through each loop individually, one in its forward motion and the other in its return motion, making the complete stitch, thereby decreasing by one half the slack silk or thread to be pulled tight at the completion of each stitch. This arrangement enables the patentee to form each loop with but one hook instead of two, the using of only one hook enabling the operator to work much smaller button or other holes than if two were used. *Patent completed,*

902. J. H. Johnson. *Improvements in rotatory engines.* (A communication.) Dated March 31, 1862.

This invention consists in the employment of a pair of disc wheels, having a number of steam ports cast therein, each disc being fixed on a separate shaft of its own. In place of the two shafts being in the same axial line with each other, they are placed at an angle, so that one edge of the discs will be nearer together than the opposite edge. The steam ports or passages pass through the discs, and the corresponding ones in the inner faces of the discs are connected by expansible bags or tubes of vulcanized india-rubber, or other suitable material. A valve is so arranged as to admit the steam into each port successively, as the discs revolve, the steam entering that port and bag or tube which is situate at the point where the edges of the discs are nearest together. As the steam expands this tube, it tends to rotate the discs, and bring the next succeeding port under the valve, which then receives steam in its turn, and so on, the exhaust taking place through the opposite disc, and at a point where the expansion of the tube is no longer of service. Motion is transmitted from these discs by having spur teeth cast thereon, gearing into corresponding pinions on a second motion shaft. The bearings which support the shafts of the two disc wheels are made adjustable on their tables, so as to regulate exactly the angles of the two shafts. *Patent abandoned.*

903. H. Pooley, Jun. *Improvements in the construction of weighing machines and weigh bridges.* Dated March 31, 1862.

This invention relates to improvements upon that part of weighing machines and weigh bridges termed the steel yard or weigh beam. In the improved machines, by means of a compound poise or travelling weight, the patentee, firstly, dispenses altogether with the loose weights representing tons or hundred weights, as the case may be, and which in many of the ordinary weighing machines are placed on a counterpoise scale depending from a knife edge, which knife edge is immovably fixed into the extremity of the long arm of the steel yard; and, secondly, by a peculiar arrangement, he virtually elongates or contracts the said long arm of the steel yard, by which he secures a command over the balance never before attained either in range or per ancency. *Patent completed.*

904. W. M. Craustox. *Improvements in machinery for cutting corn and other crops.* (A communication.) Dated March 31, 1862.

This invention is not described apart from the drawings. *Patent completed.*

905. J. T. G. Stone. *An improved bustle and petticoat.* Dated April 1, 1862.

In carrying out this invention the inventor uses a flat band fitting round the waist, kept in shape by several semi-circular pieces of steel or metal, the said band having eyelet holes therein, through which the "steels" or wires of the bustle pass, such bustle being made of loops of steel, having the smallest loops at each end and the largest in the centre. To the said flat piece he also secures a petticoat, that is, he takes a sufficient number of lengths of the said steel, and, having formed them into loops or circles, he proceeds to fasten them to pieces of tape or ribbon in such manner that, when the upper ends of these tapes are fastened to the said bustle by eyelets or such like means, and the said bustle adjusted to the figure, the hoops or circles shall fall into or form a "full" under slip or petticoat, the largest circle or hoop in circumference being at the bottom, and the smallest being nearest the bustle. *Patent abandoned.*

906. P. R. Couchoud. *A loom for manufacturing chenille and other lace work.* Dated April 1, 1862.

Instead of making one chenille at a time, the patentee makes, on this loom, two, three, four, or more, and that without forming several guts or wires, one gut only being used for several chenilles if desired. The improved loom is composed, essentially, as follows:—The patentee employs several boards or cylindrical plates pierced with holes, and destined to receive an indefinite number of spindles of a large toothed wheel placed beneath, the two plates or boards receiving motion from the motor, and transmitting it throughout the mechanism of bobbins or spools which furnish the foundation wires or gut of the chenille. These threads or wires, to the number of two or more for each chenille, are intended to hold the cut threads of which the chenille is made. There are two or more endless cords turning round pulleys from the interior to the exterior of the machine or loom, and there is a fixed knife, or one having a come-and-go motion, cutting the girt which is formed by the silks leaving the spindles. There is or are one or more friction rollers to each chenille, intended not only to take and hold the chenille as it leaves the other side of the rod where the gut is formed, but the friction roller nearest the knife serves to approach and firmly hold the gut by the pressure of a screw spring or other mechanism, so that the knife may operate suitably. There are also two baskets or boxes into which the chenille falls, on having the pulleys placed in the upper part of the loom, and by the movement of which, and the play of toothed gearing for this object the chenille is twisted as desired. The invention also comprises a crank, band chain, toothed gearing, or similar means of setting the loom at work, and a pedal for stopping or setting the loom in motion, whether steam, horse, water, or other power be used. In the basket above mentioned is a compartment by which means the chenille which rises does not encounter that which descends. *Patent completed.*

907. C. P. Gontard. *An improved stopping-piece for watches and other time-keepers, intended to limit the winding up of the moving spring.* Dated April 1, 1862.

This invention is intended to supersede the organ applied in all time-pieces for winding up the main spring, and called by watchmakers the Maltese cross-shaped piece; the effect of the said piece being to prevent the breakage of the spring. By means of this improvement the barrel is fitted more firmly, and in a style more in accordance with the principles of mechanical science. It is submitted to less friction, it works better, it is more easily manufactured, and is so solid that its breakage seems impossible. The invention cannot be described without reference to the drawings. *Patent completed.*

908. W. Clark. *Improvements in the manufacture of manure.* (A communication.) Dated April 1, 1862.

This invention consists in the employment of peat of organic nature, like ordinary manure, which is rendered assimilable by an azoted fermentation, similar to that of an ordinary dung-heap, which is effected by adding azoted or earthy saline matters, such as blood, manure, urine, fecal matters, guano, animal detritus, ammoniacal salts furnishing azote, natural and fossil phosphates, such as bones, calcined or otherwise, ashes, vegetables furnishing earthy phosphates, sea-weed ashes, salt of soda or potash, either natural or artificial, for furnishing the necessary alkalies to the plants. *Patent completed.*

909. W. Clark. *Improvements in kneading machines.* (A communication.) Dated April 1, 1862.

This invention relates to an improved mechanical kneading machine for the manufacture of dough for bread or pastry. The inventor forms it of a trough, in which works an agitator or kneader for mixing the dough. The agitator is of a novel form, having no central shaft; it is composed of two curved right and left helical spirals formed of open bars. A rotating movement is imparted to this agitator by means of suitable gearing, which lifts the dough on both sides of the trough, throws it from one side to the other, and then allows it to fall between the open bars, during which it encloses the air contained. *Patent abandoned.*

911. W. Turner. *Improvements in machinery or apparatus employed in the manufacture of dough, and especially of fermented dough.* Dated April 1, 1862.

This invention consists of apparatus for the mixing of dough, in which standards or a frame made of wood, metal, or other convenient material, are or is employed for supporting the rest of the machinery or apparatus. On the upper part of these standards or frame are bearings in which run two cranked or other conveniently shaped shafts or axles, which said shafts or axles revolve in opposite directions. The patentee attaches to each shaft or axle an iron bar, rod, or arm, which bar, rod, or arm, as the aforesaid shaft or axle revolves, slides, or moves up and down in a slot; or the bar, rod, or arm itself may be slotted, in which case it would slide or move up and down on a pin or stud. The slot, pin, or stud, which may be provided with friction rollers, to facilitate the sliding or moving of the bar, rod, or arm, is attached to the standard or framework in a perpendicular line with the bearing carrying the shafts or axles. The bars, rods, or arms are employed for the purpose of communicating motion to the mixers in the mixing trough, the path or range of which said motion will be determined, partly by the distance at which the slot, pin, or stud is placed from the shaft or axle, and partly by the length of the bar, rod, or arm. He attaches to each arm a mixer, and these mixers are composed of bars of iron or wood, or other convenient material, which may cross each other at every revolution of the shaft or axle, or less frequently if desired. These mixers do not revolve on their own axis, but each of them passes through the dough, one in one direction and the other in an opposite direction, and thus will incorporate the flour with the liquid without the excessive manipulation which has been hitherto required, and is injurious to fermented dough. Power is communicated to the mixers without piercing the trough at either end, or at the sides thereof; the trough, therefore, is perfectly even throughout. *Patent completed.*

912. F. Knudsen. *Improvements in chronometers.* Dated April 1, 1862.

In carrying out this invention the inventor connects to the arms which carry the compensation bows what he calls auxiliary bows. Each of the auxiliary bows, like the primary bows, carries a weight or weights, the position of which upon the bows can be varied to adjust the balance correctly. The auxiliary bows are also, like the primary compensation bows, made of two metals, but the metals of which the auxiliary bows are composed are arranged in the reverse way to the metals composing the primary bows. The auxiliary bows will thus, upon an increase of temperature, move the weights carried by them away from the axis or arbor to which the arms carrying the bows are connected, and upon a decrease of temperature will move the weights towards the axis or arbor. The auxiliary bows will, therefore, tend to cause the chronometer to gain on a decrease of temperature, and to loose on an increase of temperature. The primary bows must, therefore, be made thinner to counteract this effect, and thus for a given variation in temperature the weights carried by them will move through a greater space. *Patent abandoned.*

913. H. SMITH. *Improvements in apparatus used when casting iron or other metal.* Dated April 1, 1862.

For the purposes of this invention a carriage or truck is used with upright and frames suitable for receiving a ladle between them. At the upper part of these end frames there are bearings for an axis, on which axis there is fixed a barrel on which is wound a chain to which the ladle is suspended. The axis is arranged nearer to one side of the carriage than the other, by preference, but it can be placed in the centre if required, and the end framings are strongly braced or connected together. On the axis is fixed a screw or worm wheel, which receives motion from a screw or worm on a suitable axis, on which is fixed a handle or hand wheel, by which motion is given to the axis of the screw or worm, and, consequently, to the barrel in order to raise or lower the ladle: or it may be raised or lowered by gearing or ratchet wheel and lever. To facilitate the tilting of the ladle, the tilting bar is received into hooks or bearings at the two ends of the arched frame or bar which is suspended by the chain on the barrel. The four wheels of the truck or carriage are suitable for running on a rail or tramway laid down between the cupola or other melting furnace and the place where the moulds are situated. *Patent completed.*

914. J. H. JOHNSON. *Improvements in machinery or apparatus for spinning cotton and other fibrous substances.* (A communication). Dated April 1, 1862.

This invention relates more particularly to what are known as mule spinning machines, and consists firstly, of an improved mode of driving the spindles, for which purpose a double-grooved wharve or pulley is fixed or formed upon the lower portion of each spindle, and one strand of an endless band is made to pass alternately upon opposite sides of the upper series of grooves, whilst the opposite strand of the same band is similarly passed round the opposite sides of the lower set of grooves of the series, both sides or strands of the endless band being thus made to operate equally upon the opposite side of each spindle. The band, before entering, and after leaving the series of wharves or pulleys is guided by stationary guide pulleys from and on to a larger grooved driving pulley situate at each end of the machine, motion being transmitted to the band at each end simultaneously. The second part of this invention consists of a peculiar construction of spindle which the inventor proposes to make much shorter than the ordinary spindles, and of a hollow or tubular section, in lieu of solid, excepting at the top and base. This spindle is supported upon a lower rail, and is steadied by being passed through two guide rails, situate above the supporting rail, parallel thereto. The third part of this invention consists of a peculiar form of the tip of the spindle, which it is proposed to make either conical or slightly rounded, and to form a helical slot or groove therein, into which the yarn enters, and passes thence into a small central aperture made vertically in the tip of the spindle, from which central point the yarn receives its twist, in place of passing or slipping over the end of the spindle at each revolution, as heretofore. The fourth part of this invention consists in lubricating the spindles by the application to the parts requiring lubrication of a piece of felt or other absorbent material saturated in oil or other good lubricant, such piece of saturated material being enclosed in a suitable box or receptacle provided with a hinged cover, which, when closed, will press the material gently against the part to be lubricated.

915. H. W. CASLON and G. FAGG. *Improvements in casting printing types, and in apparatus for rubbing the same.* Dated April 1, 1862.

This invention is not described apart from the drawings. *Patent completed.*

916. H. W. WHITEHEAD and G. BRAY. *Improvements in machinery for carding wool and other fibrous substances.* Dated April 1, 1862.

These improvements consist, firstly, in introducing between the cylinder or swift and the doffer of a condenser for carding, a revolving circular saw or roller armed with teeth, so that the teeth shall work within the spaces between the rings of "card clothing" on the doffer, and shall thereby effectually complete the separation of the strips of wool or other fibre, and shall detach from the doffer all wool which may be betwixt those spaces. The wool so detached will be delivered by the saw or roller on to the cylinder or swift, either directly or by means of a stripper, to be introduced for that purpose, and by this means will be mixed with the wool on the cylinder or swift, and returned with it on to the doffer, thus securing that all the wool shall be properly operated by the "card clothing." Secondly, in taking the wool from the doffer of a one-doffer condenser. The inventors propose to use a crank and doffing knife of the same construction, and to work in the same manner as the crank and doffing knife of any ordinary scribbler or carding machine, and to use only one such crank and doffing knife. They also propose to construct the grooved roller which receives the wool from the doffing knife with sharp angled grooves, instead of rounded grooves as heretofore. *Patent abandoned.*

917. E. HARTLEY, G. LITTLE, and J. HINCHCLIFFE. *Improvements in rolling or straightening metal spindles, shafts, or rods of a cylindrical or tapered form.* Dated April 1, 1862.

This invention consists in submitting spindles, shafts, or rods to the action of the rollers which extend in the direction of the length of the said articles, in combination with a stop piece, against which the articles are caused to abut. *Patent completed.*

918. J. PLATT and W. RICHARDSON. *Improvements in mules for spinning and doubling.* Dated April 1, 1862.

This invention relates to communicating the ordinary intermittent motion to the "change" or "cam shaft," for which purpose the inventors use an arrangement similar to that known in cotton machinery as the differential motion. *Patent abandoned.*

919. H. J. MADGE. *Improvements in coating iron sheets or plates, to be used as a substitute for tin or terne plates.* Dated April 1, 1862.

The patentee claims the use of antimony in producing alloys for coating metallic sheets or plates, to be used in place of tin or terne plates, as described. *Patent completed.*

920. J. PLATT and W. RICHARDSON. *Improvements in machinery or apparatus used for applying motive power derived from bullocks, horses, or other animals.* Dated April 1, 1862.

This invention consists in taking the power from two or more parts of the wheel to which the animals are connected. Thus the patentees employ a toothed wheel with internal or external teeth, carried by a vertical axis, and in connection therewith are two pinions connnected by gearing to a shaft by which the power is conveyed. The aforesaid wheel is provided with shafts or levers to which the animals are yoked, and beneath it are placed wheels or pulleys upon which it may be supported. To the rim of the wheel are connected beams which extend to the central shaft, and these beams are shut after the manner of roofing for buildings. *Patent completed.*

921. H LORENZ and T. VETTE. *Improvements in filters.* Dated April 1, 1862.

The first part of this invention consists in forming or producing hollow porous bodies or objects of charcoal, of any desired shape and size, but more especially in the form or shape of hollow balls, spheres, or shells. The hollow ball or other body is fitted with a socket, into which the short end of a syphon pipe is screwed, or otherwise secured, which communicates with the hollow space of the ball or other object. When thus fitted with a syphon, the said ball constitutes a complete and independent filtering apparatus, which can be applied to any vessel or holder of liquid, and put into immediate operation by the immersion of the ball in the liquid. The water or other liquid passing through the filtering medium or body of the ball rapidly fills the hollow space, and the syphon having been likewise filled by immersion or by suction, as usual, the water or other liquid will flow from the long end of the syphon on the tap being opened; not drop by drop, as in ordinary filters, but in a continuous stream, and with a rapidity proportionate to the surface of the ball or filtering medium. The second part of the invention has for its object to increase the purifying, disinfecting, and decolorizing properties of filters made and formed as above described, and it consists in filling, or partly filling, the hollow space in such filters with loose particles of prepared animal or vegetable charcoal. The third part of the invention consists in the application of the hollow ball or otherwise shaped body of filtering medium, as mentioned in parts first and second, to vessels or holders of liquid without the use of syphons. *Patent abandoned.*

922. W. C. HARRISON and H. J. STANLEY. *An improved instrument or tool for boring or drilling holes in slate or other rock.* Dated April 2, 1862.

The patentees claim feeding or supplying the cutter with water through a tube or channel, or tubes or channels, so as to deliver it at or contiguous to its point of contact with the rock, without interfering with the discharge of the débris, which arrangement not only prevents the cutter from being injuriously heated, but at the same time washes away and forces back the borings immediately they are detached from the rock, and prevents clogging. *Patent completed.*

923. G. HOLCROFT. *Improvements in the construction of blast furnaces.* Dated April 2, 1862.

This invention consists in gathering or contracting the lining above the enlarged space now generally formed around the tuyeres, and from this gathering or contracted part the remaining of the lining to the top is either parallel, contracted, or enlarged. The object of this peculiar form of the lining is to concentrate the gases, to prepare the charges in their descent down the upper part of the furnace, and to concentrate the heat at and below the gathering or contracted part for the purpose of more rapidly melting the charges. By enlarging gradually the upper portion of the lining, the deleterious gases can escape with facility. *Patent abandoned.*

924. G. SCRATTON. *Improvements in shades or blinds for windows.* Dated April 2, 1862.

This invention relates to improvements in shades or blinds for keeping the sun's direct rays off windows, the object being the obtainment of an improvement in the appearance of such blinds, whilst they admit a great amount of light through the windows, and permit of an agreeable prospect outwards. The improved shade or blind is composed of a series of narrow frames, covered with any suitable blind or shade material, each frame being disposed vertically, and at a shorter distance asunder, somewhat less than the width of the frame, the set forming a row in front of the window to be shaded. These shade or blind frames are sustained in position by pairs of parallel horizontal bars into which each frame hinges, one edge of each frame into one bar, and the other into the fellow bar. These bars are of equal length, and are fastened by turning pins (except in cases where the edges of one of the shades at each side of the window become the turning pins) to brackets or cross pieces fitted on to perpendicular spindles or side bars, one spindle or bar being placed on one side and one on the other side of the window. The spindles or bars turn freely in fixed brackets made to receive their ends or axle pins at the ends. If the shades be intended to be removable, the irons or brackets must be fastened to a perpendicular piece, one on each side, which pieces fasten and unfasten with hand screws, or studs, and slots to the wooden wold, or otherwise as the case may be. These perpendicular pieces may be joined at the top and bottom, so as to form a light frame. The shades are opened and closed or set to whatever inclination is required by turning the spindles or vertical side bars on their axes. Whatever motion is given to one spindle or bar is communicated to the other, and to all the intermediate shades simultaneously. *Patent completed.*

925. S. WARREN. *Improvements in machinery for transmitting motion obtained by animal power to agricultural and other machines.* Dated April 2, 1862.

This invention is not described apart from the drawings. *Patent completed.*

926. R. A. BROOMAN. *Improvements in memorandum, pocket, and other books, and in pencil and pen holders to be used therewith.* (A communication). Dated April 2, 1862.

The first part of this invention consists in making the covers of such books of a material such as slate, or other mineral or plastic substance, capable of receiving writing, and which may be removed, when desired, by washing or otherwise. One side of the book is composed, for example, of a sheet of natural or artificial slate, held on three sides in a metal frame carrying hooked gudgeons. To the back of the book a metal band is attached, beneath which the fourth side of the slate is slid; the ends of the band are bent to form slides in which the two hooked gudgeons take, and thereby render the frame solid with the band. By this means a fresh slate may be inserted when the old is used or broken. The other side of the book is made of card-board, wood, leather, or other material, carrying in the centre a metal frame in which a sheet of natural or artificial slate is placed; or both sides of the book may be made alike. The improvements in pencil and pen holders are as follows:— The ink holder is screwed on at one end of the case, and the pen holder acts as a stopper to it. A socket inside the case is screw-threaded at each end to receive either a black lead or a slate pencil. The pen holder is made hollow to contain a box for leads. The invention cannot be fully described without reference to the drawings. *Patent abandoned.*

927. W. MALAM. *An improvement in the manufacture of gas and improved apparatus to be employed in such manufacture.* Dated April 2, 1862.

According to this invention the inventor charges the retort without opening it, supplying it with coal or material in small quantities at a time gradually, and, if desired, continuously, and at a rate that may be regulated as required, so that the heat is maintained and concentrated in the retort, and is not uselessly absorbed, but expends its full working force on small quantities at a time, and the whole of the charge has its gas extracted from it. He generally feeds the retort at or about the centre, or from end to end. In the apparatus that he prefers to employ (though others may be used) a hopper is fitted to the retort with which it communicates by a passage leading thereto, and a feed or compartment wheel is placed between the hopper and retort. This wheel consists of a number of compartment or cells set round an axis; the section of the mouth of each cell is larger than the section of the feed opening or bottom of the hopper, so that, as the wheel revolves, each cell fills with coal which it carries down with it and discharges in the retort. *Patent abandoned.*

928. A. V. NEWTON. *Improvements in bits for taming or subduing vicious horses and breaking colts.* (A communication.) Dated April 2, 1862.

According to this invention the bit is formed of two bars, connected centrally by a pivot, so that they may expand and open, or distend the mouth of the animal, either by an automatic arrangement, or at the will of the rider or driver. *Patent completed.*

PROVISIONAL PROTECTIONS.

Dated July 30, 1862.

2157. F. C. Warlich, 10, Alma-terrace, New Cross, gentleman. Improvements in machinery for dressing and shaping stone. A communication.

Dated August 18, 1862.

2318. H. Boetius, 9, Roehampton-street, Besborough-gardens, Pimlico. Improvements in fire-proof materials.

Dated August 22, 1862.

2348. H. Twelvetrees, Bromley, manufacturer. Improvements in the preparation of washing powders, soap powders, and cleansing crystals.

Dated August 29, 1862.

2402. P. W. Mackenzie, Jersey City, New Jersey, and S. W. Smith, Brooklyn, New York. Improvements in vehicles to be propelled by the rider.

Dated September 4, 1862.

2444. J. Cook, Esq., 9, Fitzroy-place, Kentish Town. Improvements in carriages.

Dated September 17, 1862.

2552. W. and W. H. Watson, Harrogate, York, manufacturing chemists. An improved process or processes for the preparation of certain colouring matters from aniline.

Dated September 19, 1862.

2567. W. Tytherleigh, 28A, High-street, Marylebone, manufacturing ironmonger. An improved heater for ironing or pressing.

Dated September 25, 1862.

2614. F. Tolhausen, 17, Faubourg Montmartre, Paris, civil engineer. An improved steam cultivator. A communication.

Dated September 26, 1862.

2624. W. Pettet, Philadelphia, Pennsylvania, United States, merchant. An improved covering for protecting vessels and forts from shot, shell, and other warlike missiles. Partly a communication.

Dated September 29, 1862.

2638. R. Griffiths, 69, Mornington-road, Regent's Park, London, engineer. Improvements in the construction of iron ships and in the method of fastening metal sheathing thereon to keep them from fouling.

Dated September 30, 1862.

2651. R. Hoyle, Newchurch, Lancaster, woollen printer. Improvements in machinery or apparatus for printing surfaces of woollen, mohair, cotton, and other fabrics.

2653. J. L. Hughes, Droitwich-road, Worcester. Improvements in producing ornamental patterns in gold and colour on porcelain, earthenware, glass, and enamel.

2655. J. Wright, 12, Copthall-court, Throgmorton-street, civil engineer. An improved rotative travelling crane. A communication.

Dated October 1, 1862.

2657. P. G. V. Byl, 3, Upper Hyde Park Gardens. A power conserver brake for utilizing the power expended in stopping or retarding machinery, locomotive or other engines, and vehicles of any description when in motion. A communication.

2658. R. W. Greenwood, and C. J. Marson, 13, Gloster-crescent, Islington. A new and improved mode of using the exhaust steam of steam-engines by reconveying the same into the boiler.

2659. B. Donkin, Bermondsey, engineer. Improvements in bearing for shafts, axles, pivots, and sliding surfaces for the purpose of diminishing friction. A communication.

2661. W. C. Cambridge, Bristol, agricultural implement maker. Improved apparatus for washing clothes, applicable also as a churn.

Dated October 2, 1862.

2662. J. Gilchrist, Glasgow, consulting engineer. Improvements in boring engines such as are used for mining purposes.

2664. W. C. Wilkins, Long-acre, lighthouse engineer. Improvements in gas burners.

2665. E. Suckow and E. Habel, Manchester, engineers and machinists. Improvements in machinery for preparing, spinning, and doubling fibrous materials.

2666. J. H. Johnson, 47, Lincoln's-inn-fields, gentleman. Improvements in the permanent way of railways. A communication.

2667. G. J. Firmin, Millwall, Poplar. Improvements in the treatment of certain salts of potash and lime.

Dated October 3, 1862.

2668. F. Ensor, West Bromwich, ironfounder and machinist, and W. Payne, Birmingham, engineer. A new or improved apparatus for regulating the pressure of steam in steam boilers, and for indicating when the water in steam boilers is too high or too low.

2669. J. Harrop, Manchester, analytical chemist, and J. Wadsworth, Salford, machinist. Improvements in deodorizing refuse, organic, fecal, and urinous matters, and in a method of utilizing coal and other ashes, and in machinery or apparatus connected therewith, for producing a portable manure therefrom.

2670. T. J. Robotham, Burslem, chemist, and Edward Oswald, Stoke-upon-Trent, agent. Improvements in apparatus for purifying "glaze," "slip," or other potters' materials.

2671. R. Broadbent, commission agent, Leeds. Improvements in gas regulators.

2673. W. Clark, 53, Chancery-lane, engineer. An improved candlestick. A communication.

2674. W. E. Gedge, 11, Wellington-street, Strand. An improved suction and lift pump, and apparatus connected therewith. A communication.

2675. A. Dalrymple, 18, Eyre-street, Sheffield, clothier. Improvements in the processes of depositing metals by galvanic action either with or without the aid of galvanic batteries, and in the ornamentation of metal surfaces thereby.

2676. W. E. Gedge, 11, Wellington-street, Strand. An improved marquetry or veneer saw, and machinery or apparatus connected therewith. A communication.

2677. T. Greenwood, Leeds, machine maker. Improved machinery for cutting staves.

Dated October 4, 1862.

2678. J. and W. Lee, Humberstone-road, Leicester. Improvements in traction engines and boilers for traction, locomotive, and other purposes.

2679. W. H. Muntz, Millbrook, Hants. Improvements in armour for the protection of ships of war, and other vessels and fortifications, from the effects of cannon shot and other projectiles.

2680. A. Barclay, Caledonian Foundry, Kilmarnock, engineer. Improvements in printing textile materials and fabrics, and in machinery therefor.

2681. W. E. Gedge, 11, Wellington-street, Strand. Improved means or apparatus by the use of which pierced or perforated cocoons may be spun. A communication.

2682. S. Amphlet, Birmingham, manufacturer. An improvement or improvements in ornamenting surfaces of wood.

2683. J. E. Billups, Halswell-terrace, Cardiff. Fixed point for railways.

2685. F. Parkinson, 114, Wood-street, City. Improvements in ladies' shawls and cloaks.

2686. F. Watkins, Smethwick. Improvements in apparatus for milking cows.

2687. F. E. Blatspiel, Warwick Court. Improvements in diving apparatus, and apparatus to be used for working in deep water. A communication.

2690. F. Johnson, Great Charlotte-street, Landport, Portsmouth, French polisher. Improvements in domestic fire-escapes, and in receptacles for the same.

2691. W. Taylor, Oldham, cotton spinner, and S. Buckley, millwright. Improvements in machinery for preparing cotton and other fibrous materials.

Dated October 6, 1862.

2692. R. Page, Great Yarmouth, builder. Improvements in stables and stabling applicable in part to kennels, and to the floors of fish houses.

2694. J. Bradbury, Pendleton, mechanic, and W. Bradbury, Oldham, mechanic. Certain improvements in carding engines.

2695. D. Lowe, Aston, near Birmingham, manufacturer. Improvements in the manufacture of door bolts and latches.

2696. S. Holland, Oldbury, machinist. Improvements in machinery for the manufacture of bricks, drain, sanitary, and other pipes, tiles, quarries, and other articles of like manufacture, made from clay, marl, and other plastic substances.

2697. W. Clark, 53, Chancery-lane, engineer. Improvements in articles of clothing. A communication.

2698. J. Newnam, Crayford, manufacturer. Improvements in apparatus for crystalizing and for evaporating.

2699. T. Beards, Stowe, Buckingham. Improvements in machinery for cultivating land.

2700. S. F. Cox, Bristol, tanner. Improvements in washing and tanning hides and skins.

2701. A. V. Newton, 66, Chancery-lane, mechanical draughtsman. Improved apparatus for drying grain. A communication.

2702. C. Chinnock, Queen's-road West, Regent's Park, merchant. Improvements in the construction of axle-boxes.

Dated October 7, 1862.

2703. J. Heap, Ashton-under-Lyne, tool maker. Improvements in screw stocks and dies.

2704. J. Smith, Eedon, near Worcester, blacksmith. An improved screw linch-pin for carriages and agricultural implements.

2705. W. Aston, Princip-street Works, Birmingham, button manufacturer. Certain improvements in the manufacture of buttons for ladies' and gentlemen's wear.

2706. J. Oxley, Frome, Somerset, brewer's engineer. Improvements in apparatus for expressing and separating beer from yeast or barm.

2707. F. Rhales, Albert-street, professor of music. An improved safety envelope.

2708. A. Forbes, Canal-terrace, Aberdeen. Improvements in connecting together parts of vessels formed of tin and plate, and in the means or apparatus employed therein.

2709. J. D. Welch and A. P. Welch, Gutter-lane, straw hat manufacturers. Improvements in machinery for blocking and pressing hats and bonnets.

2710. H. D. P. Cunningham, Bury House, near Gosport, Esquire. Improvements in working the guns and in performing other necessary work on board ships, and in apparatus employed therein.

2713. A. V. Newton, 66, Chancery-lane, mechanical draughtsman. Improvements in the construction of condensers or coolers. A communication.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

1713. C. Hook. Steam engines.
1714. J. Lovegrove. Inspecting small sewers and drains.
1726. J. Kinlock, and T. Edmeston. Looms.
1732. J. B. Ingle. Reaping and mowing machines. (A communication.)
1734. J. Shand, and S. Mason. Steam boilers.
1735. W. Lennan. Safety stirrup.
1736. J. D. Wake. Ships and vessels.
1737. H. Bland. Sewing machines.
1740. D. Crichton, W. Donbavand, and D. Crichton. Looms.
1746. J. Ingham, and W. P. Wood. Preparing colouring matters.
1752. A. Salviati. Gold and other precious metals. (A communication.)
1759. J. H. Glew. Sewing machines.
1773. W. Bouch. Cranes.
1774. R. A. Brooman. Cooking ovens. (A communication.)
1776. R. Hicks. Manufacture or preparation of paints, pigments, and colours.
1787. J. Hunt. Bronzing or colouring articles of copper or alloys of copper.
1799. J. Warren. Ploughs.
1805. A. Howat. Water gauges.
1811. E. J. Davis. Food for animals.
1814. W. Jeffries. Rail for railways.
1820. D. Adamson, and L. Leigh. Construction of steam boilers.
1832. H. and J. Davenport. Loom healds or harness.
1840. J. Lawson. Manufacture of carpets.
1841. E. Edmonds. Manufacture of felted articles. (A communication.)
1842. T. Wilson. Dress fastening.
1846. A. Webster. Boring slate.
1847. W. Barr. Manufacture of raised or brocaded fabrics.
1862. W. Clark. Ploughs. (A communication.)
1867. E. H. Huch, and F. J. Windhausen. Caloric engines.
1868. J. Whitham. Hydraulic presses.
1875. T. R. Tebbutt. Manufacture of soap.
1919. G. H. Birkbeck. Utilization of certain refuse. (A communication.)
1938. G. H. Birkbeck. Construction of mechanical horses. (A communication.)
2020. S. Partridge. Railway signals.
2286. G. White. F. Buckland, and C. Rees. Water-closets.
2401. W. Owen. Manufacture of railway wheels.
2444. J. Cook. Carriages.
2513. J. Thom. Mounting or fitting artificial teeth.
2516. J. Rowell. Pillars and apparatus for straining wire.
2582. L. Dixey, and G. Smith. Improved method of tinting.
2633. H. Hutchinson. Covering wire with india-rubber and gutta-percha. (A communication.)

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2357. J. H. Brown.
2380. J. Higgins and T. S. Whitworth.
2396. J. Bruckshaw, H. Bruckshaw, and W. S. Underhill.
2364. S. Newberry and H. Moore.
2385. A. S. Rott.
2398. R. Hobson.
2448. J. W. Hackworth.
2414. P. Jones.
2462. R. A. Brooman.

PATENTS ON WHICH THE STAMP DUTY OF £100. HAS BEEN PAID.

2354. T. Valentine, D. Foster, and G. Haworth.
2311. E. Wilkinson.
2336. S. Statham.
2345. W. Basford.

LIST OF SEALED PATENTS.

Sealed October 17, 1862.

1136. R. Dennison.
1141. R. and G. Stuart, and H. Hill.
1142. B. Rhodes.
1146. W. Rose.
1151. A. P. Tronchon.
1153. E. H. C. Monckton.
1159. R. A. Brooman.
1161. T. Attwood.
1165. C. C. Creeke.
1166. T. Lea, and S. Smith.
1167. E. H. C. Monckton.
1177. W. Moir.
1178. G. N. Bates.
1180. W. Carpenter.
1184. A. Hodgkinson.
1186. G. T. Bousfield.
1191. J. Endean.
1196. J. Winsborrow.
1197. G. Davies.
1201. F. Dangerfield.
1215. J. Shaw.
1223. E. A. L. Negretti, and J. W. Zambra.
1228. J. G. N. Alleyne.
1233. A. Boyle, and T. Warwick.
1263. M. Henry.
1275. J. Oxley.
1324. P. V. Lefebvre.
1329. T. Wilson.
1361. T. Markland.
1364. N. Wood, and J. Stockley.
1900. C. Callebaut.
1912. W. Easton, and G. Donkin.
1990. E. Townsend.
2052. O. F. Morrill.
2067. W. Tranter.
2075. W. Clark.
2097. W. Clark.
2104. H. Rawson, and F. Staples.
2256. C. A. Wheeler.
2267. J. Cooper.

LIST OF SPECIFICATIONS PUBLISHED

For the Week ending October 18, 1862.

No.	Pr. s. d.	No.	Pr. s. d.	No.	Pr. s. d.	No.	Pr. s. d.	No.	Pr. s. d.	No.	Pr. s. d.
621	0 8	636	0 4	651	0 4	666	0 4	681	0 4	696	0 4
622	0 10	637	0 8	652	0 6	667	0 10	682	0 4	697	0 8
623	0 4	638	0 4	653	0 4	668	0 10	683	1 2	698	0 4
624	0 8	639	0 4	654	0 4	669	0 4	684	0 10	699	0 4
625	1 4	640	0 4	655	0 4	670	0 10	685	0 8	700	0 4
626	0 6	641	0 8	656	0 6	671	0 4	686	0 4	701	0 10
627	0 4	642	0 6	657	0 6	672	0 4	687	0 8	702	0 4
628	0 8	643	0 4	658	0 10	673	1 0	688	0 4	703	0 10
629	0 4	644	0 8	659	0 10	674	0 10	689	1 4	704	0 4
630	0 4	645	0 8	660	0 4	675	0 4	690	0 8	705	0 4
631	0 4	646	2 2	661	0 4	676	0 4	691	0 8	706	0 4
632	0 4	647	1 2	662	0 10	677	0 4	692	1 2	707	1 8
633	0 4	648	0 8	663	0 4	678	0 4	693	0 4	708	0 6
634	0 4	649	0 4	664	0 6	679	0 4	694	0 4	709	1 0
635	0 8	650	0 10	665	0 4	680	0 4	695	0 4	710	0 4

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

TO CORRESPONDENTS.

Received—J. M., Capt. N., T. M., T. M., M. J. R., G. C., J. N., G. H. B., C. H. T., W. A., A Practical Engineer, J. V. G., F. W., W. A., W. B., T. M., J. P. D., J. R., J. N., J. D. C., H. and H., J. N., A. C. E., F. C. W., W. H. E., F. W., C. D., W. W., J. D., Sir J. V. D., W. H. G., M. D., F. A. P., A. Z.

BOOKS RECEIVED.—"The True Theory and Dimensions of the Earth," by J. O. Gumpach.—"American Maps," published by Bacon and Co., Paternoster-row.—"On Photo-Zincography," by Capt. A. de C. Scott, R.E., Longman and Co.—"Treatise on the Mathematical Theory of the Steam-Engine," by T. Baker, C.E., Virtue and Co.—"Handbook of the Telegraph," by R. Bond, Virtue and Co.—"Patent Dock Gates," by R. A. Peacock, Weale, High Holborn.

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, OCTOBER 31, 1862.

IRON WALLS AND NAVAL GUNS.

TO THE EDITOR OF THE "MECHANICS MAGAZINE."

GUN TOWER SHIPS.

SIR,—I will devote the space accorded to me in your columns this week to the consideration of cupola or revolving tower ships. That form of armour-plated structure for naval warfare is attaining much importance. The Federal Americans, who, already possess four or five iron-cased vessels on the "Monitor" plan, are building twenty or thirty more of a similar description, varying in size and in details of construction and armament, but all on the revolving-turret principle. We are building two cupola ships on Captain Coles's plan, one, the "Royal Sovereign," a wooden vessel, at the Portsmouth Dockyard, the other an iron vessel, at Mr. Samuda's yard. The Confederates give the preference to the "Merrimac" plan of covering the vessel with a sloping iron roof, and so far as we know, they have not adopted the cupola system. The French, it has been stated, after a careful examination of the gun-tower principle, have decided upon not making use of it, the French Ordnance Committee, and the Emperor himself, it is alleged, having come to the conclusion that the inconveniences, difficulties, and dangers of the plan, in a practical view, over-balance any advantages it may possess.

The *Times* has recently given prominence to this question. The editor of that powerful journal is too grand and lofty to acknowledge my criticisms of its naval intelligence, but the arguments in his recent articles on this subject afford unmistakeable evidence that I have induced him to consider the subject of heavy naval guns, and to modify his opinion. I cannot, however, compliment him on his knowledge of the subject or the logic of his reasoning.

Only a few days ago, the *Times* deliberately asserted, "we have not a vessel *which will carry* a seven-ton gun." To which I replied that the "Warrior" will carry, not only a 7-ton gun, but a number of 12 or even 24-ton guns. That journal now makes the discovery that ships may be produced which will carry those heavy guns, and announces that the "Royal Sovereign" is to be armed with 12-ton Armstrong's; and it sees no reason why a vessel should not carry five 20-ton guns as readily as twenty 5-ton guns. That was precisely my argument, which the *Times* now indorses, after having dogmatically maintained "that a gun of 95 cwt. is the heaviest that can be worked with success, or even safety, on board a floating vessel." We shall agree by-and-bye; the great journal is famous for its versatility, and ere long it will *frankly* admit that ships now afloat, such as "La Couronne" and "La Normandie," can and will be armed with those terrible 150 and 300-pounders, which would smash in the sides of the "Warrior," if in action she is armour-plated after her present fashion. I am determined to afford all the help I can to tear away the scales from the eyes of the Lords of the Admiralty; and, despite the advocacy of the leading journal, enable them to see the gulf of perdition into which they will cast the naval reputation of England, if they do not adopt a more efficient system of naval armour than 4 or 5 in. of iron plate on wooden planks.

The *Times* tries to escape from the dilemma in which it involved itself by its too reckless attempts to prove the invulnerability of the "Warrior." It admits that cupola or tower-ships may carry 12 or 24-ton guns, but it maintains that vessels built on the ordinary principle cannot. At this point I join issue, and I submit that those remarks prove that the writer of the articles, which lately appeared in the *Times* on heavy naval guns and cupola ships is not well posted, (to use a Yankeeism) on the subject, which he affects to decide upon *ex cathedra*. He has confounded the carrying capacity of a ship with the platform and deck arrangements for bedding and training the guns, and he has not perceived the distinction between displacement or floating capacity and gravitation which deermines her stiffness in the water. The higher the centre of gravity the more the vessel will roll. The lower the centre of gravity the steadier she will be. The "awful rolling," for which the "Warrior" is so celebrated, is caused by the heavy armour plates and guns overhanging her top sides and raising the centre of gravity, on which she oscillates to an elevated point above her keel.

With the centre of gravity lowered and a smaller amount of oscillation the guns practically for fighting purposes might be more out of the water at an elevation of 7 ft. than they would be at 9 ft. above the load line. The "Warrior," like the "Royal Sovereign," possesses the capacity of carrying 12-ton or 24-ton guns, and her superior tonnage enables her to carry a larger number without altering her displacement or trim; but she would not carry them so conveniently as the latter vessel, although, with the same weight of metal as her present armament in heavier guns, she would probably labour less than she now does.

The 40 guns of the "Warrior," taking them in round numbers at 5 tons each, weigh 200 tons. Ten guns of 20 tons each would be the same weight. It of course can make no difference in displacement whether this weight be distributed in 10 large or 40 small masses. The former, like the latter, can be equally distributed from stem to stern along both sides of the vessel, so that the centre of gravity and the angle of oscillation would be the same in both cases. The only modification required for the heavier guns would be the construction of larger and stronger platforms or beds, with more substantial supports under the gun deck, and some simple mechanical contrivance to facilitate the working of the guns. Taking all things into account, there seems to be little doubt, that the ten 20-ton guns could be worked with a smaller number of men, and more commodiously, considering the greatly enlarged space for each gun, than the forty 5-ton guns.

Placing guns along the centre of the deck, as in the plan of construction of the "Royal Sovereign, is referred to by the *Times* as if that arrangement enabled the vessel to *carry* heavy guns. But this is palpably a mistake. The carrying power of the ship is not augmented by placing the weight of the guns amidships; that power, as before stated, is simply a question of displacement. But the effect of the disposition of the guns and iron towers along the centre of the deck, as in the "Royal Sovereign," is to enable the vessel to carry the weight of her guns and armour more commodiously. This, no doubt, is a great advantage. The sides of the ship above the load-line being relieved from a notable portion of their burden, she will stand up stiffer, she will roll less, and steer better—all valuable points for a sea-going ship; but in a cupola iron-clad, on the plan of the "Monitor" or "Royal Sovereign," the advantages, as I will show hereafter, are gained at a terrible sacrifice of the comfort and confidence of the crew, and the efficiency of the ship, by restricting the cabin and fighting space, and discouraging the sailors when in action. The moral effect on eight or ten men to one gun, shut up in an iron box, and cut off from the rest of the crew, will tell prejudicially on the spirits of the men, and the working of the guns in a close conflict.

There can be no doubt, for the reasons above stated, that the disposition of heavy guns along a central line fore and aft, which is effected by Captain Coles's plan, is a decided advantage; but this advantage must not be confounded with the revolving tower system. To determine the precise character of his invention under its different aspects, the position of the guns and the round tower principle, whether rotating or fixed, must be considered separately. Neither has any necessary connection with the other. Either plan may be carried into effect by itself apart from the other. Some of the inconveniences of working one or two pieces of heavy ordnance within the narrow limits of an iron chamber, with just space enough to train the guns, have been referred to. But there are other serious objections. If a gun should burst, the effect would be terrible; every man in the tower would be killed or mutilated. The fighting force, the best men in action, are subdivided into small sections, completely isolated from each other, which in warfare is the worst system of tactics. One hundred gunners, manning the guns on one deck, encouraging and stimulating one another by mutual aid and example, would be more effective in a hotly-contested battle at close quarters than double that number in ten detached towers. The upper deck of a cupola ship is peculiarly unsuited for repelling boarders or attacking an enemy by boarding. The crew cannot be suddenly and simultaneously withdrawn from and returned to their quarters on the gun-deck. The men, having no bulwarks to protect them, cannot remain on the upper deck exposed to the fire of musketry and grape, and yet a vigilant and constant guard of the upper deck in close action is indispensable, because a cupola ship is peculiarly susceptible to assault by boarding. If the enemy once got possession of that deck, it would be difficult to drive them off, and a few men might wedge up the towers so as to prevent their rotation, and render the guns useless. The successful working of the machinery for the rotary motion in the heat of action, is by no means to be depended upon; an accident to the mechanism for training a gun would render it unserviceable. As broadside guns at close quarters, the Coles cupola system will be inefficient for pointing them between wind and water. This objection, in adapting the "Royal Sovereign" as a cupola ship, became so palpable that, after she was cut down, it was found that the *maximum* depression range of the guns would be so small, that it was necessary to raise the gun platform deck several feet, and new upper deck beams and frames, to carry the towers at a higher elevation, had to be constructed. By this alteration the last-mentioned objection is in some measure abated, but not removed, and it must always remain one of a serious character.

In fact the cupola scheme was suddenly brought into notice by the gallant onslaught of the "Monitor" on the "Merrimac," but her success at most was negative, and the critical position of her crew was proved by their state of exhaustion from the want of ventilation. The designer of the closed tower

shield is so sensible of this alarming defect that he has found it necessary to contrive a system of ventilation by blowing a stream of air from below through openings in the crown of the shield. Here is another mechanical device, the failure of which, in the heat of action, would incapacitate the men from standing to their guns.

I fear that the plan of fighting guns singly inside detached towers on the deck of a vessel, as planned by Captain Coles and the constructors of the "Monitor," will, when tested by actual warfare, prove to be a complete failure; and, however unfit to encounter heavy guns, the armour and armament of the "Warriors" and "Northumberlands" may be, I believe England has nothing to fear from the American iron-cased navy, so long as that government does not adopt a better model than that of the "Monitor." I am also of opinion that the "Royal Sovereign" will never be the model of an efficient class of war ships in the British service. In consequence of the difficulties of construction and adaptation, which becomes apparent as the work proceeds, as well as the serious nature of some of the defects, I have pointed out, it is by no means certain the "Royal Sovereign" will be completed, or, at all events be relied upon for actual service, until she has undergone some radical changes in the original design of the inventor.

In this cupola ship case we have another example of the total want of method and consistency which prevail at the Admiralty. Four years ago, the plan was brought deliberately under their notice, and although the inventor is an ingenious and meritorious officer, it was ignored by the board, and all his efforts were in vain to obtain even an experimental trial. To make the matter worse, a cupola shield, which was constructed by Mr. Scott Russell, was allowed to remain untried and unfinished more than a year. Suddenly, in a moment of excitement, the cupola is forced on the Admiralty, which then takes immediate action in the most inconsiderate manner. After some hasty experiments with the long neglected trial cupola, which gave anything but satisfactory results, a bargain was suddenly struck with Captain Coles, who received the sum of £5,000; and two tower ships were ordered to be built. I do not remember the estimates of these vessels, but they probably will not cost less than £200,000 to £300,000. Now how much wiser and more economical it would have been to have thoroughly investigated Captain Coles's proposals 3 years ago, and submitted his plan to actual trial, on an efficient scale, before committing the country to the heavy expenditure incurred. Less than £5,000 spent on a full-sized cupola, fixed on a hulk, and a series of experiments against it with heavy guns, would have settled the question of the merits of the plan, or have suggested some notable improvements; but that is not the Admiralty method. That inscrutable department prefers an expenditure of a quarter or half a million on *experimental ships* to the prudent forethought of preliminary trials, of promising plans at an expense of a few thousand pounds. Instead of that obvious rule of prudence, which ought to make the Admiralty act with liberality in target trials, it jesuitically refuses the funds for experiments recommended by its own committee, on the plea of economy, or under false pretences; whilst, *without any previous trials*, it rushes into an outlay of millions on a system of naval armour which, after eight or ten ships are built, and twenty more contracted for, is ascertained by experiment to be worthless.

In the remarks I have made on Captain Coles's plan, I am far from wishing to underrate the ability or merit of that officer. He deserves the remuneration he has received for the ingenuity of his conception and the independence with which, regardless of the professional disfavour he provoked in high quarters, he persisted in urging on the Government the trial of a plan which he thinks beneficial to the service. Great credit is due to him for initiating an improvement in floating batteries, by placing the armament in the centre of the vessel fore and aft, but I think he is mistaken in his mode of applying the principle.

CIVILIAN.

HOW TO PREVENT RAILWAY ACCIDENTS.

In another part of the Magazine will be found the substance of a paper read by Mr. John Sewell, in one of the sections at the British Association's recent meeting at Cambridge. There is no doubt that the writer of the paper in question has dealt therein with some practical points in connection with the economy of the railways, which are of much importance, and we are aware that his information has been gained in the school of experience. Still, we confess to a feeling of disappointment in its perusal. Mr. Sewell has lost sight altogether, so far as his paper is concerned, of at least two very momentous points in connection with the safety of railway travelling. He tells us that the "primary cause of most of the serious "railway accidents is, that railway companies "are not liable either for overloading their "engines or for not keeping time at all the "stations." This, indeed, is the burden of his song throughout the whole of the paper. Mr. Sewell tells us nothing of the absolute essentiality of a complete and unmistakeable code of signals on any line of railway, or the necessity for an improved system of brakes for bringing rapidly-running trains to a sharp and sudden standstill. Yet the imperfections existing in both these particulars are, we venture to say, as fruitful sources of accident as are those referred to in Section G. of the British Association. The recent accident at Market Harborough is a case in point; and though the coroner's inquest resulted in a verdict of Manslaughter against the driver of the engine of the second train, Ezra Stubbs, yet it is pretty clear that the signals in and near the station were much at fault. It were needless to expatiate upon the second disadvantage to which we have adverted, that of imperfect brake-power in railway trams. Much ingenuity has been expended by practical mechanics and others in devising modes of checking trains running at high speeds, but it is a fact that Railway Companies have not encouraged with that earnestness and liberality which in such a cause they ought to have exhibited the efforts of inventors. Had Mr. Sewell, who has earned many mechanical laurels in times past, and whose career has been that of a patient, painstaking, and persevering worker, both with hand and with head, given the public the benefit of his knowledge of railway signals and brakes, their faults and failings, he would have made his paper far more perfect than it is. Now that the metropolis is being intersected at all points and undermined at several railways, and that Mr. Sewell's "Iron horse" is careering in all directions about the metropolis, it is more than ever necessary that a uniform code of signals, simple in character and in action, should be established, and that the movements of the "horse" should be governed completely by the grooms, so as to speak, who sit behind the animal.

Excepting the omissions of which we complain, Mr. Sewell's paper is entitled to consideration, and if that gentlemen chooses to supplement his views by touching upon the points we have named, our columns are open to him for that purpose.

Reviews.

A Treatise on the Principles of Electrical Accumulation and Conduction. By F. C. Webb, Associate of the Institution of Civil Engineers. Part 1. London: E. and F. N. Spon, Bucklersbury.

It is but seldom we have to notice anything strikingly novel or original in the form of a treatise on electrical science. Works on electricity are for the most part mere compilations, and the authors generally appear to copy and follow each other without much difference of opinion or novelty of doctrine. The present work however will afford some new and interesting views of electrical phenomena to those who study the latter from a mathematical, or, rather, from a geometrical point of view; that is to say, to a large section of inquirers in this branch of science. In the first part, which we now have before us, the difficult questions relating to Electrical Accumulation are brought within the reach of rule and number, and the practical electrician is shewn that he may calculate the resistance to Electrical Accumulation, in much the same manner as he calculates the resistance to Electrical Conduction. It will be perceived, from what we have said, that the work is intended for the more advanced student of electrical science, rather than for the beginner, who might expect to find in it descriptions of electrical machines and batteries, or the details of electrical manipulation.

We may follow the author through a few of the first steps of the work, which will be sufficient to show the general character of this contribution to our electrical knowledge. We commence with the fundamental axiom, that "Whenever electrical generation occurs, whether by chemical, frictional, or thermal action, exactly equal amounts of electrical action of opposite nature occur on the opposite sides of the source of generation." If we require to obtain in a free state a certain quantity of *plus* electricity, termed also vitreous electricity by those who hold the double-fluid theory, we may readily produce it by means of the electrical machine or the voltaic battery; but we necessarily at the same time liberate an equal quantity of *minus* or resinous electricity. We may, therefore, at the same time that we "accumulate" the plus electricity upon an insulated conductor, obtain the minus electricity as a charge upon a similar conductor. In so doing, however, we find a greater difficulty in obtaining a charge of given amount, or we require a higher electrical intensity than if we connected one "side of the source of generation" to an insulated conductor, and the other to earth. The reason of this will be found explained at p. 66, *et seq.* The readiest means of charging a conductor, say with plus electricity, is to connect to earth the rubber of the electrical machine, or the negative pole of the battery, and to establish a conducting communication between the prime conductor of the machine or the positive pole of the battery, and the body upon which the electricity is to be accumulated.

This brings us to a point upon which Mr. Webb lays great stress, and which indeed is one of considerable importance in regard to the due appreciation of some of the main points of electrical theory. What becomes of the electricity generated on that side of the source which is connected to earth? The great majority of writers, among whom are Prof.

Daniell, Sir W. Snow Harris, and Messrs. Lardner and Walker, assume that this electricity becomes distributed over the indefinitely large surface of the earth, and is thus "virtually annihilated." The author, on the other hand, maintains that it becomes accumulated upon the nearest conductors surrounding the body which is charged with the opposite electricity. "The electricity generated at that side of the source in connection with the earth is as much conducted to and distributed over the adjacent opposing conducting surfaces as the other electricity is spread over the insulated conductor, and thus the outer opposing surface is in every respect as much a charged surface as the prime conductor, the difference being only one of degree." The following experiment is suggested as being calculated to decide the question:—An electrical machine is placed within an *insulated room*, the rubber of the machine being connected to the walls. Upon charging the prime conductor with positive electricity from the excited glass disc of the machine, the inner surface of the conducting material of which the room is formed acquires a negative charge of exactly the same quantity as the charge upon the prime conductor. That this is the case would be shown by bringing this conductor into conductive communication with the walls of the room, thereby neutralizing the charges and removing from both surfaces every trace of free electricity. Now, if the room be uninsulated or connected to earth, we have ample evidence to prove that the effect of charging the prime conductor of the machine would be precisely the same as under the former conditions, the inner surface of the chamber becoming negatively charged, and none of the negative electricity generated being conducted to earth and distributed over its surface.

The assumption that every time a conductor is charged with plus electricity, the negative charge is distributed over the whole surface of the earth, is clearly untenable; and Mr. Webb has rendered a service to electrical science in clearly pointing this out. In every case we find that the opposite electricity becomes accumulated at the nearest possible distance from the surface of a charged conductor. The conditions which prevail in a charged Leyden condenser are common, therefore, to every instance of electrical accumulation. In the Leyden jar, the distance, or thickness of the dielectric, between the oppositely-charged surfaces, which determines the "inductive resistance" to charge, is inconsiderable; and the quantity of the opposite electricities which can be accumulated, under a given intensity, upon the conductive surfaces, is therefore comparatively great. The term inductive resistance is employed to express the converse of what is known as "inductive capacity." A formula for the inductive resistance of cylinders, derived from the well-known expression of Ohm for prismatic resistances (R = ;), has already been given by M. Gaugain, who, as Mr. Webb observes in the introductory notice to his work, has pointed out the general applicability of Ohm's law to problems of electrical accumulation. Messrs. Thomson, Siemens, and Varley have also adopted, to a certain extent, the method of treating the resistance to accumulation in the same manner as Ohm has treated the resistance to conduction, a method which forms the principal characteristic of the present portion of Mr. Webb's treatise.

The Albert Memorial Committee of Bath have entrusted to Mr. Matthew Noble the execution of a colossal bust of the late Prince Consort, which is to be placed in the new building to be added to the Bath United Hospital.

Proceedings of Societies.

CIVIL AND MECHANICAL ENGINEER'S SOCIETY.

F. CAMPIN, ESQ., C.E., IN THE CHAIR.

"ON SETTING OUT RAILWAY WORKS."

BY G. J. CROSBIE DAWSON.

October 23rd, 1862.—The author commenced by observing that railway making in England has been carried on to so great an extent, especially since the memorable year 1845, that after looking at a map of England shewing the existing and authorized lines, there does not seem space left anywhere for new ones, and yet there were no less than 170 plans for proposed railway schemes deposited at the private bill office for last session, proposing the construction of 1,800 miles of new line in the United Kingdom, of which 1,497 miles are in England.

But this state of things cannot go on very much longer, for in a few years time there will be no need of more lines, and the railway engineer, if he still wishes to practice in that branch of the profession, must go off to India, Australia, or New Zealand, where he will have a wide field before him; or he must go to some foreign country, for strange to say, most of the foreign railways have been, and are being made by English engineers. There were at the end of the year 1861, 10,433 miles of railway in the British Islands, and comparing the progress of the railway system in England with that of other countries, we find that with the exception of America, we have many more miles of railway in England than in any other country.

The author then went on to say that of course a great deal depended on the selection of the best line of railway to be obtained, which necessarily involves a great deal of time and trouble, and should be guided by many circumstances, the principal object being generally the connection of two distant towns, or the joining of two lines of railway by means of a branch from one, or of affording accommodation to smaller towns not on the main line by means of branch lines. To obtain the most direct route is of course desirable; this, "as the crow flies," would evidently be a straight line, which, in the generality of cases, would be quite impracticable, as there are other requisites of as much importance to be considered of. Therefore, as it is next to impossible to get a perfectly straight line, a railway must consist of a system of curves and straight lines, the curves being of such radii and flexure as will suit the nature of the country as regards the levels, the towns lying in the vicinity of the main line, and the keeping intact of valuable property, &c.

Since all moving bodies have a tendency to preserve their motion in a direct line, sharp curves on a railway are highly objectionable, as the centrifugal force arising upon them tends to throw the train off the rails, especially one of great velocity, which would be strongly impelled towards the exterior rail, and would, were it not prevented by the flanges of the wheels and the conical inclination of their tyre, run off the rails altogether. This conical inclination of the tyre of the wheels, which increases the diameter of the outer, and diminishes that of the inner wheels, and which causes the train to roll on a conical surface, generates, except in curves of very small radii, a centripetal force to counteract the centrifugal. But, however, this is not enough to counteract the force in curves of very small radii, and a superelevation of the exterior rail is required for the purpose, which in a curve of 30 chains radius would be about 1½ in., if the rate of the train was about 30 miles an hour. Therefore, of course, the flatter the curves are the better. The least objectionable situation for them is at the extremities of the line, or stations on the level where all trains stop, where they frequently occur of about ten chains radius or less, but on gradients, or in tunnels, they are most certainly to be avoided as being very dangerous, the undesirableness of them also increases with the speed of the train. Mr. Brees says that a rise of 16 ft. per mile or 1 in 330 upon a curve of three-quarters of a mile radius, reduced the speed of a locomotive to nearly one-half.

On the Great Western Railway the curves are very flat indeed; Mr. Brunel objecting to any under one-mile radius; indeed he considered that undesirable, and for the most part they are of 4, 5, and 6 miles radius, unless close to a large station. Mr. Stephenson was also for flat curves, the radii of them being, on the old London and Birmingham Railway generally exeeding a mile. Now, finding that they are practicable, we have them very much sharper, as is necessary in many instances. On the Chester and Crewe, line there is a curve of 18 chains radius at the Crewe terminus; and the Grand Junction joins the Liverpool and Manchester line in 2 curves of 10 chains radius each; on the Newcastle and Carlisle Railway there are two curves of 10 chains radius, which are traversed constantly by trains at the usual speed; and on the Taff Vale Railway there are curves of 7 and 10, and several of 15 and 20 chains radius, and, indeed, a great many of the branches now made have curves as sharp. Where the Crystal Palace Railway, after running by the side of the South Western, suddenly curves round and passes at right angles under it, just before crossing the Thames into Victoria station, the radius is about 20 chains, and very shortly there will be as much traffic over it as on any line in England; for when the West London Extension Railway is opened, there will be trains from the London and North Western, and the Great Western Railways, as well as the Brighton and South Coast and Crystal Palace traffic.

The author next called attention to the subject of gradients, remarking that they ought to be such as to render the works as light and inexpensive as possible, due regard being paid as to how much earthwork, tunnelling, viaduct, and bridge work may be saved consistently with the required velocity, the expenses of engine power, and the general wear and tear of the rolling stock and brakes. Of course, if the gradients are steep, there will be a less amount of earthwork in the cuttings and embankments, and less land will be required; also, the viaducts and tunnels will be shorter, whereby there will be a saving both in labour and expense; but this must be carefully weighed with the expense in locomotive power, repairs, and speed, &c., attendant on it.

A few years back steep gradients were thought to be quite impracticable by almost all the engineers, the ruling gradient on the London and North Western being 1 in 330, or 16 ft. per mile; on the Great Western Railway they are mostly 1 in 1,320, or 4 ft. per mile, though there are one or two at 1 in 660; and the Box tunnel and Wootton Basset inclines are 1 in 100. It was Mr. Joseph Locke who first attempted sharper gradients, making his lines suit the surface of the country, instead of the reverse, as was the custom before. He practically demonstrated that inclines of less than 1 in 100 could be safely and economically worked; but all the European engineers of the day regarded such an attempt as a very bold and hazardous experiment. Navier, and the whole school of French engineers, opposed *in toto* the admission of inclines of less than 1 in 200. But, however, owing in a great measure to the wonderful improvements in the manufacture of locomotives, many of which were no doubt due to Mr. Locke, gradients of 1 in 100, and very much steeper, have been successfully adopted. There is a gradient on the direct Portmouth of 1 in 80 for a length of 6 miles, and another on the Caledonian of 1 in 70 for 2 or 3 miles. The fall into Euston Station, on the London and North Western, is at the rate of 80 feet per mile, or 1 in 66. The author then, after enumerating several of the steepest gradients on the various railways, said that a short time ago there was a gradient of 1 in 25, or thereabouts, on the West London Railway, between the London and North Western and Great Western Railways, and that he, with some friends of his, saw in December, 1859, an engine

draw 40 empty waggons up it, but the line has since been altogether altered. Mr. Vignoles states that scarcely once in 20 times does a locomotive engine go out with more than half its load; and, as a general rule, engines are only worked up to two-fifths of their power, and therefore that railways, in his opinion, should be made in the cheapest manner, without minding stiffish gradients, as on extraordinary cases an additional engine could be put on. If possible the stations should be on the summit of two gradients, as they would tend to stop the train coming in, and to accelerate its starting: a piece of level should also always be inserted between two gradients inclining different ways, and care should be taken that there is no useless loss of power.

The author, then, after mentioning some interesting experiments made by Dr. Lardner, on heavy gradients some years ago, proceeded to the more practical part of his paper. He entered fully into the particulars of the large detail survey for the contract plans and sections, observing that the Parliamentary Plan was quite useless for setting out the line by being plotted to such a small scale, 5 chains to the inch being usually the largest to which they are plotted; indeed, 4 inches to the mile is a very favourite scale, being the smallest allowed by standing orders; and also that for the most part they are not of sufficient accuracy, being got up in such an incredibly short time, and sometimes even patched up and "cooked" from old tithe maps, &c., the surveyors working night and day in the dismal month of November to save their deposits on the 30th. The detail survey having been made, the engineer, previous to the final setting out of the centre line, should exercise all his judgment in making any improvements that are possible for economising the construction of the works, &c., by a more correct balancing of the cuttings and embankments, or shortening of any viaduct or tunnel, &c., for which purpose he should carefully examine the ground with the plan and section in his hand. Of course, particular attention must be paid to every road crossed by the railway, as also the most suitable site for the stations and approach roads, &c., not forgetting the important question of drainage.

The author then proceeded to explain the method of setting and staking out the centre line, calling particular attention to the ranging out of curves. He gave several examples: one by which the curve is set out by means of theodolite angles and a chain; a second in which a chain, a few ranging poles, and an offset rod is all that is required; and another where two theodolites are required, supposing obstructions occur preventing the use of the chain, which last method he took from Baker's "Railway Engineering."

He then entered fully into the staking and nicking out of the centre line, and taking the levels for the contract section, as also for the cross sections, observing that permanent posts should be fixed into the ground—to have bench marks on for reference to levels at future periods, when all the other pegs have been removed—at certain convenient points, such as near the sites of bridges and culverts, &c., or near the commencement of excavations or embankments.

The author next explained the methods of setting out the widths, both on level and sidelong ground, and concluded his paper with a few remarks on the nature of the strata in embankments and cuttings, giving the angles that the various formations will stand at. The paper was illustrated by several large diagrams.

It has been decided to allow the Loan Collection of Works of Art, now exhibiting at the South Kensington Museum, to remain open in its present entirety, until about the time when the International Exhibition closes. Shortly after this date, a certain number of the articles, such as the gold and silver plate belonging to the numerous bodies contributing, will be returned. The extreme liberality of many private owners of large and valuable collections will, we understand, lead them to allow their treasures to remain before the public for a somewhat longer period.

INTERNATIONAL EXHIBITION. JURY REPORTS.

CLASS VIII.—MACHINERY IN GENERAL.

(*Continued from page 250.*)

APPENDIX TO CLASS VIII.

The trial of manual fire-engines took place on the 17th of June, commencing at eight o'clock in the morning, and lasting until six o'clock in the evening. By permission of his Royal Highness the Duke of Cambridge a convenient space of ground was marked out and railed off on the south side of the Serpentine in Hyde Park; posts were erected, holes for suction were dug, and handrails, spars, water targets, gauged tanks, blocks, halliards, and other gear were provided. Working lists were prepared beforehand to facilitate and methodize the entries of particulars, and a strong party of officers and firemen of the London Fire Brigade attended during the trials, and afforded skilled assistance to all who required it. Two hundred men of the Guards were present, and worked the manual fire-engines, and a party of police did equally good service in keeping order during the day.

Owing to the extreme clearness of the atmosphere, and the almost total absence of wind, the day selected for the trial of manual fire-engines proved in the highest degree favourable for the purpose. The barometer stood at 29·87 inches.

On the day subsequent to the trial the Committee assembled for the purpose of making awards according to the rules laid down at their first meeting, and after mature deliberation, it was resolved to make the following awards, which they beg to recommend for confirmation by Her Majesty's Commissioners:—

Names of Makers.	Description of Fire Engine.	Award.	Remarks.
Fowke	Manual ...	Medal ..	As inventor—engine well adapted for military purposes.
Kurtz	Manual	Hon. Men.	Compactness, simplicity, and good performance.
Lee	Steam	Medal ..	Ingenuity of design, and good workmanship.
Letestu	Manual ...	Medal ..	Excellence of construction, durability, and good workmnship.
Merryweather (Decorated by Casentini) ...	Manual	Medal ..	Improvements in design, good workmanship, & performance.
Roberts	Manual ...	Medal ..	Ingenuity of design.
Shand and Mason	Manual	Medal ..	Good workmanship and excellent performance.

Summary.

	English.	Foreign.	Total.
No. of engines in the building	37	6	43
No. of makers of engines . .	10	5	15
No. of engines offered for trial	15	3	18
No. of medals awarded . . .	4	2	6
No. of honourable mentions .	—	1	1

Although no further awards could be made, the Committee next proceeded to take the necessary steps for trying the steam fire-engines on the 1st of July, and, as before, invited the engine builders to a preliminary meeting, that they might receive full information as to the rules and regulations to be observed.

In compliance with this invitation, the following engine-makers attended a meeting on the 28th of June, viz.:—

Mr. Lee, of the firm of Lee and Larned, Novelty Ironworks, New York.
Messrs. Merryweather and Son.
Messrs. Shand and Mason.

Mr. Lee declined to produce his steam fire-engine for trial, alleging various reasons for so doing, and though strongly urged, persisted in his resolution, and declined the contest.

Messrs. Merryweather and Son expressed themselves ready to produce their steam fire-engine on the appointed day.

Messrs. Shand and Mason informed the Committee that the engine which they had intended to work would not be ready owing to an accident, but requested permission to produce for trial two steam-engines made by them for the London Fire-Engine Establishment, although they were not in the Exhibition. All the arrangements having been made for trying several engines together, the Committee granted this request, as otherwise only one engine would have been present, and a complete table of results could therefore not have been obtained.

The Committee assembled in the appointed place at eight o'clock on the morning of the 1st of July, and found three engines present, viz., one of Messrs. Merryweather and Son and two of Messrs. Shand and Mason.

After the Committee had examined the boilers and machinery generally, the engine-makers filled their respective boilers with cold water from the river, and fires having been laid, the three were lighted at the same moment, and the makers were ordered to commence working into a tank at sixty feet distance as soon as they had attained a steam-pressure of 100 lbs. to the square inch.

Messrs. Merryweather's engine attained the pressure named in 12 minutes 10 seconds, Messrs. Shand and Mason's large engine in 18 minutes 30 seconds, the small engine in about 30 minutes, some mismanagement having occurred which compelled them to draw the fire in the latter and light it a second time. Messrs. Merryweather's engine commenced working as arranged when the steam-gauge indicated a pressure of 100 lbs., and was 2 minutes and 50 seconds at work before water passed through the nose-pipe. Notwithstanding this very serious defect, this engine had poured 500 gallons of water into a tank 60 feet distant in 17 minutes and 15 seconds from the time at which the fire was lighted. After the difficulty of drawing the water had been surmounted, this engine worked well and threw an admirable jet, losing 15 lbs. steam-pressure during the first trial. After three trials this engine became disabled; it was, however, repaired on the ground in about an hour and a half, and resumed work at the ninth trial, continuing to work well until the thirteenth, when it became again disabled, and was withdrawn by the maker, to the great regret of the Committee, who were thus left to continue the experiments with only two engines, both made by one firm.

Messrs. Shand and Mason's large engine was 18 minutes 30 seconds getting up steam to 100 lbs., and when started drew water instantly, losing during the first trial 5 lbs. of steam-pressure.

This engine was severely tested, and worked without accident throughout the day, the seventeenth trial lasting no less than 63 minutes, during which the steam and water were both kept to a pressure of 90 lbs. on the square inch throughout, working through a 1⅛-inch nose-pipe.

At the eighteenth and last trial this engine threw a good vertical jet.

Messrs. Shand and Mason's small engine did not raise the steam to 100 lbs. in less than 30 minutes, owing, of course, partly to the mismanagement already mentioned, and partly to the nature of the boiler and fire-box, which, according to the makers' account, are not adapted for raising steam in the shortest possible time. After the engine got to work the steam-pressure was well sustained, and the engine continued working the entire day without accident, concluding in the evening by throwing a good vertical jet.

During the time occupied by the trials the direction of the wind was W.N.W. to W. by N., pressure 2½ to 4½ lbs. on the square foot. The barometer stood at 29·07 inches.

Summary.

On the whole the Committee find as follows:—

Messrs. Merryweather and Son have produced, at a price of £700, a steam fire-engine, weighing, according to the makers' account, 65 cwt., with jets and lamp, but without water, coal, suction-

pipes, hose, or other gear, and capable, if no accidents occur, of throwing in an available stream the following average quantities of water per minute :—

Distance.	Angle.	Quantity.
61 feet.	10 dg.	230 gallons.
85 ,,	21 ,,	124 gallons.

Messrs. Shand and Mason have produced an engine, at a cost of £650, weighing, according to their statement, 55 cwt., with jets and lamps, but without water, coals, suction-pipes, hose, or other gear, and capable of throwing in an available stream the following average quantities of water per minute :—

Distance.	Angle.	Quantity.
61 feet.	10 dg.	250 gallons.
63 ,,	18 ,,	165 ,,
82 ,,	14 ,,	172 ,,
85 ,,	21 ,,	137 ,,
102 ,,	11 ,,	94 ,,
104 ,,	17 ,,	19 ,,

Messrs. Shand and Mason have also produced, at a price of £370, an engine which, under the same conditions, weighs 35 cwt., and is capable of throwing in an available stream the following average quantities per minute :—

Distance.	Angle.	Quantity.
61 feet.	10 dg.	142 gallons.
63 ,,	18 ,,	133 ,,
82 ,,	14 ,,	56 ,,
85 ,,	21 ,,	27 ,,

The best performance during the five trials from which this last average was taken being forty-six gallons, and the lowest five gallons per minute.

At greater distances, in consequence of the wind, this engine could not deliver a stream, but continued working without accident throughout the day, and concluded in the evening by throwing a good vertical jet.

It is hardly within the province of this Committee to suggest improvements, or to do more than comment on what is actually performed ; but as the making of steam fire-engines is still in its infancy in this country, they consider it important, before concluding their labours, to place on record the following remarks, which may be found of service :—

The results of these trials show, that although something has been done towards making a really serviceable steam fire-engine, still much yet remains to be accomplished. These results show that a decided advantage is obtained in working fire-engines by steam, as compared with manual power, but there appears on the part of all the makers a decided tendency to run their pumps too fast. The Committee would also draw attention to improvements which may be made in many mechanical arrangements, viz., in the size of the suction-pipes, the supply chambers, and the valves, so as to give the greatest facility for feeding the pumps and preventing the return of the water.

Sutherland, *Chairman.*
E. M. Shaw, *Hon Sec.*

PREVENTION OF RAILWAY ACCIDENTS.

The following paper, by Mr. J. Sewell, Assoc. Inst. C.E., was read in Section G at the last meeting of the British Association :—

This is a subject of great importance, both to the travelling community and the railway interest, yet, in my opinion, it is one that admits of a solution with benefit to both parties.

Through your goodness, some years ago I was enabled to bring under the notice of the Association a paper upon the causes of boiler explosions, fracture of axles, and advantages of thick-edge boiler-plates, &c., which I believe has been useful, and I trust that my present suggestion, of a simple yet effective plan to obviate most of the railway accidents that occur, will likewise prove of utility.

The primary cause of most of the serious railway accidents is, that railway companies are not liable either for over-loading their engines or for not keeping time at all the stations. It only requires, in my opinion, to attach suitable penalties for both over-loading engines and for not keeping time, to ensure greater safety to the public, and better dividends to the shareholders. On many lines trains are more numerous than there is any need for, since every district has a regular traffic; beyond which, it requires stimulants to temporarily increase it, which stimulants, judiciously employed, do good, but, when used in excess, are both costly and dangerous, as train after train follow each other, some stopping at one station, and some at another station, and some, as express trains, at very few stations, where one train would suffice. A few accidents arise from gross neglect of signal duty, defects of the road, and breaking down of plant, which are more or less strictly accidental, for the best mechanism may, and does fail. The human being likewise may, and does fail unexpectedly at times, especially during long sustained watchfulness, whether on railways or other duty. On railways both men and mechanism frequently fail through overwork, or through surprise, caused by irregularity of the trains, as, for instance, the Brighton Tunnel and Kentish-town catastrophes, as well as many others.

Railway companies issue time bills for the guidance of their servants and of the public, but plead non-liability to keep such time. The plea is passively allowed, for there is no one to enforce time being kept; so that few trains keep time exactly at all the stations they pass, yet no effective notice is taken of this breach of contract unless through an accident. Now, as the loss of time is mainly due to irregularity in starting trains, and to over-loaded locomotives being unable to keep the specified time, it is evident that punctuality in starting trains, proper loads, and well kept time at all stations would effect a most advantageous improvement upon the present state of these matters.

It is commonly supposed that the steam horse possesses such unlimited power that a carriage or two more or less makes little or no difference to running the given distance in the given time, but this is a popular error which lies at the root of all the mischief.

The power of the steam horse is proportionably as easily overlooked, as is that of the coach or race horse, with this difference against the steam horse—namely, that he has to contend against all the contingencies of slippery rails, inclines, retarding winds, delays at stations (often due to travellers themselves), yet is popularly expected to run the distance in the given time, whether heavily or lightly loaded, whether stormy, slippery, or calm.

Now when the race horse runs against time, the weight is fixed for distance, time, and other circumstances. No one would dream of overweighting a race-horse, and then running him against the time for the lightest racing weight, yet this is the practice of railways, whereby irregularity is the result. Nature limits the power of the race-horse, and, in order to save fuel, mechanism is used to limit the power of the steam-horse, hence delays take place and risks are incurred in order to save a little fuel. This mechanism, as is well known, cuts off the steam from the cylinder some time before the power has reached the end of the stroke, varying from one-fourth to three-fourths of the length of the cylinder, so that the *real* and the *nominal* power may and do differ widely. If, therefore, an engine, having its power thus limited to take eight or ten carriages in the given time, has to take ten or twelve carriages, it follows that such overloading will cause loss of time.

But, as travellers do not know the power of a locomotive by looking at it, nor clearly understand the dangers they run on a crowded line by its being over-loaded, it becomes, I think, the duty of the Government to step in and ask for power to license each locomotive for a certain duty, and to enforce regularity of time at all stations, as essential to public safety.

It has been found necessary to licence steam-boats and common road vehicles to carry a given number of passengers only, and, in like manner, it has now become requisite, for public safety, to licence each locomotive to draw a definite number of vehicles, whether for passengers or for merchandise, and to place that licence conspicuously on each engine. Passengers generally take care that carriages are not over-crowded, and would equally take care that locomotives were not over-loaded, if they only knew the right road by referring to a licence plate on each engine. If it is necessary, for pecuniary reasons alone, that arrangements between two companies, or between the Post-office, and companies should limit the loads as they do, it is undoubtedly necessary, on the ground of safety between the railways and the public, to limit the loads to the real power of the engines.

The Board of Trade could easily carry out the required duty by means of qualified inspectors, with power to periodically alter, renew, or withdraw licenses, as the working state of each steam horse might warrant from time to time.

As such a step would probably require either an increase of locomotive power, or a decrerse of speed to work the same traffic, it would prove to that extent that the present engine-power was deficient for safe working. It is the over-loading of engines and uncertainty of time that renders excursion trains more dangerous than others, but that is no valid reason why excursion trains should be discontinued. In fact, there is no more need to deprive excursionists of their healthy, cheering trips, which contribute to recruit both their mental and bodily vigour, and railway exchequers, than there is to deprive society of food or wine, because both are occasionally abused.

Since excursion trains are a mine of wealth to a railway company, and a mine of health to the community, instead, therefore, of prohibiting them, as is too often suggested, they should be extended, as they may be without any such risk to them or to other trains as they have hitherto had to encounter. Substitute well-kept time for the present ill-kept time—licensed engines for unlicensed ones, and trains may run more frequently, and more safely than at present.

Under the present non-liability system, it speaks highly for the general vigilance of railway officials that so few accidents occur, and such an alteration as the one now proposed would be a great relief to them. The traffic on several railways now resembles that on an over-crowded street, where great difference in speeds cannot be allowed with safety; and as in crowded streets the extreme speed of the horse is dangerous, and at a moderate speed an enormous traffic can be carried on safely (along London-bridge, for instance, where there is five times the traffic of any railway), so in like manner on railways extreme speeds should be reduced to moderate ones, regularity be substituted for irregularity, whereby both safety and economy will result.

It is an axiom, I may say, that extreme speeds entail extreme costs, besides risks, for on railways as on roads or streets, costs increase in a greater ratio than velocities, so that high speeds and higher costs are synonymous and convertible terms. Limited loads and kept time duly enforced appear to me to be simple remedies for the existing dangers, which would alike contribute to the public safety and increased profits to railways.

UNSINKABLE SHIPS.

By Charles Atherton, late Chief Engineer in Woolwich Dockyard.

The following paper was read in Section G., at the Cambridge meeting of the British Association :—

Competitive rivalry in the arts of naval construction and ordnance destruction, as applied to maritime warfare, having now, as appears by recent demonstrations at Shoeburyness, reached a condition of experimental speculation prospectively of an unlimited character; and as the consideration of this subject essentially embraces the question of the capability of an invulnerably-armoured ship to carry armament with reference to the size of the ship itself, it is presumed that a paper thus involving the details of naval ar-

chitectural construction may be appropriately brought forward and discussed in the Mechanical Section of the British Association for the Advancement of Science.

The object of this communication is not to discuss the question, whether, by an unlimited expenditure, ships can be made invulnerable to the assaults of all present and future ordnance, nor is it intended to damp the ardour with which peace must be upheld by the moral effect of preparation for any adverse eventuality by our practically adopting, for the time being, in common with other nations, the recognized principle of "invulnerability." My object on the present occasion is simply to bring forward the question, whether the principle of "unsinkability," as based on the average specific gravity of the materials of which a ship may be constructed and loaded being less than the specific gravity of water, and as distinguished from "invulnerability" as dependent on armour plating, may not be advantageously introduced as supplementary to our present system of naval construction.

This subject has for some years engaged my attention, and in anticipation not only of the now-realized efficacy of direct fire, but also in anticipation of a totally new era of mortar practice not yet entered upon, whereby the decks of vessels may undoubtedly be assailed by the descent upon them of a huge weight (say 10 tons), projected to a great height (say 300 feet) at short range (say 100 yards), thereby attaining precision of descent, and falling almost vertically on the deck, and passing out through the bottom of an adjacent ship. Anticipating such results, I have already, by various publications, and officially in my late capacity as Chief Engineer of Woolwich Dockyard, directed attention to the principle of "unsinkable ships," as a means of obviating the fatal effects at sea of such devices. Mr. Atherton then read a letter of his which appeared in the *Times* on the 10th of January, 1859. It was as follows:—

Sir,—Many suggestions have of late been brought before the public on the construction of gunboats, mortar boats, and floating batteries, with a view to make them invulnerable; and I now beg to add my views on that subject. Why not make the floating body for such special services, up to the line of its load displacement, a solid mass of material of such specific gravity lighter than water that it shall not sink, however much it may be perforated by shot? It appears to me that a solid combination might be made of cork shavings, light wood sawdust, rush stems, cotton waste, flocks, hemp, and other light material, which by the aid of a solution of gutta percha, or other chemical process, would form a solidifying mass, so tough that it could not be knocked to pieces by shot, and so light that it would be only one-half the specific gravity of water, and therefore unsinkable, however perforated by shot, and capable of carrying armament and naval equipment to the extent of nearly one-half the weight of its own displacement in tons. Such vessels of light draught accompanying fleets of war as tenders to line-of-battle ships, whence they might be manned and stored as occasion might require, would, I submit, form a useful auxiliary available for shore service, or for attacking land batteries, which deep draught ships of the line cannot approach, and would be sunk if they could.

I may observe that this idea was first broached by me two years since as being applicable to the construction of vessels for carrying treasure. They might be wrecked ashore, but the treasure would be recoverable.

In respect to the practical carrying out of the general principle of "unsinkability," announced in the foregoing letter, I beg further to explain that I do not anticipate depriving war of the glory and honour which can only be purchased by blood. Without the sacrifice of blood in war, the naval and military calling would be ignominious, and the national spirit would become degenerate. No, let ordnance do its best. I would, however, seek in the construction of "unsinkable ships" that the life of a man may not be sacrificed by an ounce of lead, and that the whole crew of a ship may not be simultaneously drowned through the effective application of a single shot, or the descent of a single thunderbolt down through the deck and bottom of the ship, or by the lateral concussion of a hostile ram. With these views I always anticipated that the principle of "unsinkability" would, if adopted, be carried out, not exclusively by making the ship solid up to her load line, but on various plans of arranging and disposing of the buoyant material according to the special requirements of the service contemplated; for example, a treasure ship built for being laden with specially valuable goods may, if so preferred, be a mass of buoyant material up to its load line. But a steam-ship may be constructed with its engine-room below the level of the load line; into this the water may possibly get access, but the ship when thus water-logged would be saved from going to the bottom by a sufficiency of buoyant material being constructively disposed of in various parts of the ship, such, for instance, as the hull and decks above the load water line being composed of as great a mass of material as is equivalent to the entire capacity of hold in space left vacant below the load water line.

Of course the efficacy of this system would be entirely dependent on the degree in which the specific gravity of the buoyant material may be less than the specific gravity of water. Various communications have already been made to me announcing the discovery of natural substances and artificial compounds not exceeding half the specific gravity of water, and apparently suitable for being used as a buoyant material in the construction of unsinkable ships on the principles thus set forth. The practical prosecution of the subject is obvious, and the details of arrangements manifestly so adequate to the special objects for which a ship may be intended, that I need not, on the present occasion, encumber this promulgation of my views by entering into details. I would merely further observe that the mass of buoyant material may be so selected and disposed of that it may contribute greatly to the strength of the ship. Of course, in the practical adoption of this principle, as compared with the ordinary construction of ships, there must be a sacrifice of capability, but when it is considered that the great mass of buoyant material may be distributed below the water line, and thus conduce to the stability of the ship instead of being above the water line and thus impairing the stability of the ship, as is necessarily the case with the armour plating of invulnerable ships; and, moreover, when it is considered that the principle of unsinkability is applicable to vessels of small size, whilst invulnerability by iron armour plating can only be carried out with vessels of enormous magnitude, it may be confidently anticipated that the principle of unsinkability by the agency of buoyant materials, as distinguished from the principle of invulnerability by the agency of armour plating, is worthy of attention for mercantile purposes, especially in time of war, and as a supplementary adjunct for co-operating with ships of war in shoal waters where armoured ships, by reason of their necessarily great draft, cannot operate. In prosecuting the operations of war, ordinary ships, defended by unsinkable ships or otherwise kept out of harm's way, would be available as barracks, hospitals, and store ships for their accompanying fleet of unsinkable ships, of which the stowage for stores may be deficient.

KAMPTULICON.

So called from its flexible character, is designed to supersede the ordinary floor-cloth. Its chief recommendations are great flexibility, softness, imperviousness to damp and dust, great warmth (owing to its non-abstraction of caloric from the feet), noiselessness, and extreme durability. Its natural colour is not pleasing to the eye, but it is capable of being ornamented with any design, and with every variety of colour, so as to resemble encaustic tiles, tesselated pavement, or the best styles of floor-cloth. It is composed of cork and india-rubber, chiefly that obtained from the East Indies, and the invention is claimed for a Mr. Fanshawe, who made the first kamptulicon composition in the square shot tower near Waterloo-bridge, where he ground the cork in an old common coffee-mill. A patent was, however, granted to Elijah Galloway in 1843.

Kamptulicon is manufactured in London by Gough and Boyce, 12, Bush-lane, Cannon-street; Trestrail and Co., 20, Walbrook; and Taylor, Harry, and Co., Huggin-lane, Cheapside.

The buildings for the manufacture of kamptulicon ordinarily consist of one large room, with several ante-rooms attached, for the purpose of measuring and cutting, blocking or painting, drying and storing.

The first thing that arrests a visitor's attention is an immense quantity of cork shavings, the refuse of cork-cutting establishments. Kamptulicon has given a value to this refuse, which it did not possess when it was only employed for the purpose of stuffing fendoffs, &c. The cork is first thoroughly cleansed from dirt and other foreign substances. It is then placed in a machine, which cuts it up into very small chips; these are then submitted to the grinding action of two large millstones, worked in the ordinary manner, until the chips are completely pulverized and reduced to what may be called an extremely fine cork dust. The only other substance entering into the composition of kamptulicon is india-rubber; a quantity of this is placed in a hollow cylinder, in which an axle armed with strong teeth is made to revolve rapidly, the cylinder being heated by the admission of steam into a surrounding box or chamber. The machine itself is very properly termed a *masticator*, and in a short time reduces the rubber to a kind of resinous pulp, having the consistency of baker's dough. When sufficiently masticated the mass is removed from the masticator and placed upon a table, at one end of which is a pair of powerful rollers. The mass is sprinkled with the cork dust and passed between these rollers which are likewise heated by the admission of steam. Each time it passes through the rollers an additional quantity of cork dust is applied until the mass of rubber is completely permeated with it, and becomes an amalgam of rubber and cork dust; this we may term the kneading process, for the whole manufacture is only a repetition on a large scale, and by means of powerful machinery, of what is done by the pastry-cook with other materials in the manufacture of puff-pastry. When a sufficient quantity of cork is incorporated with the rubber (and this is the delicate point in the manufacture) the mass is subjected to what may be termed the laminating process. For this purpose it is taken to another table, which is of the length and width which the piece of kamptulicon is required to assume. It is then passed through a pair of rollers (likewise heated by steam) of the exact width intended for the piece; the space between these rollers is regulated by a screw, which is of such power that it is possible by its action to bring to a standstill a high-pressure steam-engine of 45 horse-power. Through these rollers the mass is passed again and again, rolled out into a thin layer, then folded over and rolled again, until the cork and rubber are completely amalgamated, and a vast number of thin layers have been formed, all bound inseparably together by the nature of the materials themselves. The proper length of the required thickness being secured, it is taken to an adjoining apartment and laid with others upon a long bench or table, where it remains several days or weeks to become thoroughly seasoned. If intended to receive a design, it is next removed into the painter's room, where, by means of blocks, it is painted according to the style intended, the paint is allowed to dry and harden, and the kamptulicon is then ready for service.

In addition to those already named, kamptulicon certainly possesses some very marked advantages over the ordinary floor-cloth. It can be joined together so neatly as to defy detection except upon the minutest investigation, so that although it is not found advantageous to make it in pieces exceeding 35 or 40 feet in length, and 4 or 5 feet in width, the largest area could be covered with it, and present the appearance of one single piece. This is done in the following manner:—The two edges are brought together with great exactness; they are then moistened with a small quantity of india-rubber solution;

the under surface of each length at the proposed joint is slightly coated with the same solution, and a narrow strip of cotton, linen, or fine canvas being placed along the proposed seam, the two edges are brought closely together. In a very short space of time the appearance and strength of one piece is secured. Width after width might thus be added *ad infinitum*.

Another advantage of the kamptulicon, being so easily joined, is that a border of any design may be attached, no matter how small or numerous the recesses of the room or hall in which it is proposed to lay it down. This is done by the manufacture of narrow strips for borders, which are stamped with the required design and colors, and joined, as already stated, to the centre piece. It would be impracticable to do this in the case of ordinary floor-cloth, as the exact form of the area to be covered would be first required, and then the cloth to be painted with the required border before the pattern for the centre was imparted to it. With this border kamptulicon presents a very pretty and unique appearance, and is well adapted for bath-rooms, halls, small rooms, or offices. For bath-rooms we consider it the *ne plus ultra* of anything yet produced. Ordinary floor-cloth is objectionable, as although it is impervious to water so long as the painted surface remains intact, it invariably strikes cold to the feet, which is both unpleasant and dangerous. Woollen carpets, again, become saturated and thus keep the atmosphere of the room damp, and themselves soon decay by being constantly moist. Owing to its warmth and extreme durability (we have seen some that after fourteen years' hard use bore scarcely any signs of being worn) it is admirably suited for nurseries; the ordinary floor-cloth is too cold, and carpeting is costly and dusty for rooms occupied by a family of young children. For public and private offices, assembly-rooms, churches, and chapels, where both warmth and quiet are indispensable, kamptulicon is an excellent, and in the long run, a cheap material. And we can only hope that the rising price of india-rubber will not stop the production of this useful article.

We were informed of a (to us) novel application of kamptulicon in the Royal stables at Windsor, and other places. By planking or paving the stable with it, the stable is not only kept warm, dry, and clean, but the usual straw bedding can be dispensed with, and by using it for partitions between the stalls, horses are less liable to injure themselves by kicking against it, and inasmuch as the noise occasioned by kicking against the wooden partition is often the cause of a horse becoming a confirmed kicker, the use of kamptulicon, which is noiseless, will tend to prevent this evil, and has been known even to cure horses of the habit.—*Building News*.

COURTAULD'S IMPROVEMENTS IN POWER LOOMS.—(*See p.* 278.)

This invention, patented by Mr. J. M. Courtauld, of Braintree, Essex, consists in the introduction into the web or fabric in course of manufacture of a slide, lever, or other mechanical agent connected with the gear by which the loom is thrown in and out of work, and made to act when no shoot is laid in, in such manner as to throw the loom out of work.

Fig. 1 of the above engravings is a longitudinal section, and Fig. 2 an end view of the apparatus; Fig. 3 is a plan of the underside thereof. *a* is a flat plate or table smooth on both its upper and under surfaces; *b* is a plate secured at one end to the under side of the table by a nut and screws *c c*, in such a manner as to give it a tendency to spring against the under side of the table *a*. This springing action may be produced by making a spring in the plate itself, or by the employment of a separate spring; *d* is a projection on this plate, to which the outer end of a light spring *e* is secured; *f* is a bolt formed with slots, to allow of its moving to and fro upon cross-headed screws *g*, whereby it is connected to the under side of the plate *b*; *h* is a stud on the back end of the bolt *f*, against which the free end of the spring *e* exerts its pressure; *i* is a carrier or bar armed with pins *k*, *k*, screwed to the outer end and upper surface of the bolt *f*; *l* is a hook fixed on the under side of the bolt; *m*, *m*, are screws, which receive and act as stops to the outer end of the plate *b* when it descends, as presently explained; *n* is a drop lever, shown broken away at Fig. 3, pivotted at one end on the spindle *o*, held in the side frames of the apparatus, at its opposite end the lever is armed with and terminates in a solid inclined-headed catch *p*, at the rear end of the catch there is a slot in the lever to give passage to the hook *l*, so that the lever may fall, as hereafter explained; *q*, *q*, are flanges on the side frames of the apparatus, by which it is fixed through screws *r*, *r*, to the angle iron *s* forming part of the framing of the loom; *t* is the loom batten; *u* is the reed attached to the batten; and *v* is a lever, having its centre of vibration coincident with the centre of vibration of the batten.

The fabric as it is woven passes upon the table *a* in the direction from A to B. In Fig. 1 the reed is shewn close up to the woven quarter, the weft pins are introduced into the web of the fabric, the last shoot or thread laid in is on the outer side of them, and exerts sufficient pressure through them on the bolt *f* to overcome that of the spring *e*, and consequently prevents the bolt *f* being forced out when the reed recedes. As the batten recedes the weighted end of the lever *n* drops, and becoming engaged in the hook *l*, it pulls down the weft pins *k*, *k*, out of the fabric, and carries down with it the bolt *f* and the plate *b*, until the sides of this plate come in contact with the heads of the screws *m*, *m*, when further descent is prevented. In this position these parts remain until the batten comes up again On its return the batten, coming in contact with the inclined face of the catch, raises the drop lever, and allows of the springing up of the bolt *f* and plate *b*, and introduces the weft pins *k*, *k*, again in the web of the fabric just before the reed has brought up the next shoot. When the shoot is not laid in from a thread having become broken, or from the shuttle having given out all its thread, there being no pressure on the pins *k*, *k*, to overcome the power of the spring *e*, the bolt is forced outwards sufficiently far to prevent the hook *l* becoming engaged with the drop lever *n*, which then becoming entirely free at its weighted end falls low enough to catch on to the top of the lever *v*, which lever always vibrates with the battens, unless held by the catch on the drop lever, as just explained. Any suitable appliances, such as levers, cranks, pulleys, or otherwise may be connected with the lever *v*, in such manner that the loom would be thrown out of gear with the motive power upon the said lever *v* being arrested, but the arrangement the inventor adopts for the purpose is shewn at Fig. 4 and 5, in which *t* is the loom batten, *v* is the lever on which the drop lever *n* hooks when no shoot is laid in; this lever *v* is attached to the batten bar by a pivot joint at 4, just at the centre of vibration of the said batten bar. 1 is a pulley and frame attached to the loom batten; 2 is another pulley and frame attached to the batten bar; 3 is a stationary pulley and frame attached to the back framing of the loom; 5 is a sliding bar flattened and slotted at its uper end, as shown in Fig. 5. This bar slides through fixed guides near each end. 6 is a coiled spring of steel wire, its upper end is attached to the top guide of bar 5, and its lower end to the bar itself; 7 is a sliding bolt, one end of which passes through an eye, and is furnished with a pin which projects through the bent slot in the top of bar 5, the other end is supported by and passes through the end framing of the loom; 8 is part of the back framing of the loom, having projections, which form the guides for the bar 5 and the bolt 7, and also the support for pulley 3; 9 is a gut line, attached at one end to the lever *v*, and at the other end to the lower end of the bar 5, this line passes over the pulleys 1, 2, and 3, as shown. When the lever *v* is prevented by the drop lever *n* from going back with the batten *t*, the slide bar 5 is pulled down by the gut line 9, and by means of the bent slot in the upper end of this bar the bolt 7 is pushed forward, and acting on the usual band fork passes the driving band from the fast on to the loose pulley, and throws the loom out of work.

A NEW MARINE BOILER.*

INVENTED AND PATENTED BY DR. FILIPPO GRIMALDI.

The object of the present paper is to draw the attention of the section to a new kind of steam boiler, adapted both for stationary and marine purposes, but more particularly to point out its advantages in the latter case, and especially when employed for generating high-pressure steam; or in iron-plated ships of war where saving of weight and space are of the utmost importance. The peculiarity of the arrangement referred to is that of making the boiler continually rotate on its axis over the furnace while at work. This involves necessarily a complete change in the shape of the boiler, as also in the mode of feeding it, and in the arrangements for the exit of the steam.

The advantages of the arrangement as regards rapid generation of steam, result from the fact that, water being an indifferent conductor of heat, this is disseminated almost entirely by a mechanical mixture of its particles, this mixture being very materially increased by the constant dipping and rising of the tubes which are dispersed throughout the boiler. Again, it is well known that where steam is generated in contact with a heating surface, if that surface be stationary, there is considerable difficulty in the steam freeing itself from such surface, this difficulty being apparently entirely removed by slowly moving the surface so as to bring it successively under new portions of water, the surface being as if it were swept of the globules of steam which have accumulated upon it.

In the rotating boiler this continual successing of the surfaces applies both to the shell of the boiler and to the tubes, their rotation being very slow, while the water is practically stationary.

The rotating boiler necessarily assumes the cylindrical shape, no other form being so suitable. It is thus specially adapted for the generation of high-pressure steam, and consequently is well worthy the attention of those who have, for some years past, been aiming at the construction of high-pressure marine boilers, their efforts, however, appearing to have failed, chiefly from such boilers being made to assume a rectangular shape; the ordinary amount of heating surface, if attempted to be obtained in a common cylindrical tubular boiler, involving considerable space, which can be ill afforded in steam vessels.

Without attempting to fix what precise extent of revolving heating surface will in practice be found equivalent to that ordinarily allowed in marine boilers, it may here be stated that from the experience already had, about one-fifth of the surface appears sufficient—9 square feet of *horizontal* surface, or 15 square feet of total surface, being usually calculated as sufficient for evaporating a cubic foot of water per hour, and 8 square feet having done this with the boiler revolving. Of course this amount of surface in both cases supposes the surfaces clean, from 20 to 30 ft. being frequently given to each horse-power in marine boilers as generally made. The rotating boiler (shown in the diagrams exhibited to the section) is cylindrical, with flat ends, and nearly filled with 3-inch tubes; trunnions are constructed at each end, through one of which the feed-pipe passes, and through the other the steam-pipe, which radiates from the centre to the circumference between the tubes, the steam entering at the highest point of the boiler, or nearly so, and thus taking no water with it; the upper tubes, or those passing through the steam space, most effectually super-heating the steam, and preventing priming. The safety valves of these boilers

* Read before the mechanical section of the British Association at Cambridge.

GRIMALDI'S NEW MARINE BOILER.

FIG. 1.

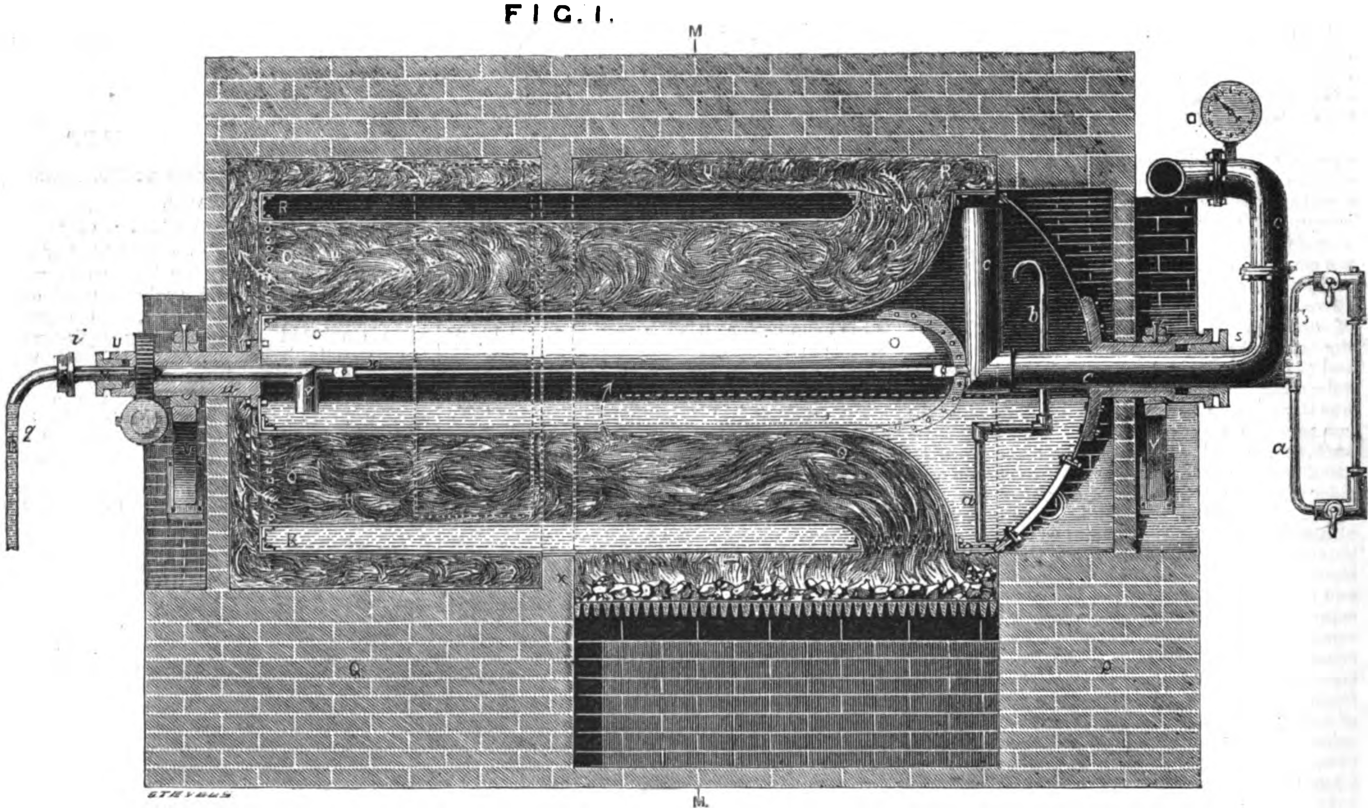
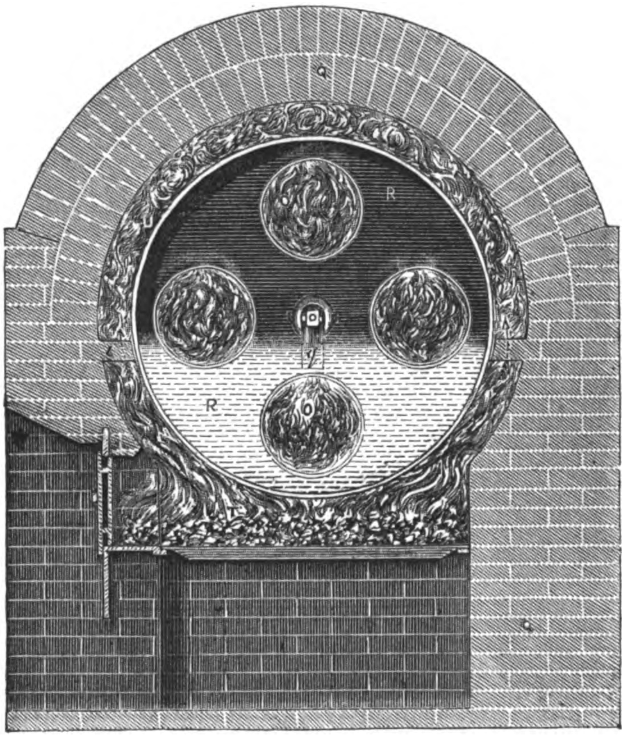


FIG. 2.



are fitted to the stationary steam pipe, and the steam and water gauges are conveniently arranged in the manner shown. The boiler is kept rotating at the rate of $1\frac{1}{4}$ to $1\frac{1}{2}$ revolution per minute, by means of suitable connection with the screw-shaft, or by a separate engine, which may also serve as a donkey for feeding the boiler and other purposes.

The whole boiler is enclosed in a brick-lined casing, or in a double iron casing filled with water, a few inches larger than the boiler, so as to give a flue space all around it. Every part of the shell of the boiler in its turn passes over the furnace which is placed beneath it, the entire boiler being thus rendered available as heating surface. This, it should be explained, is one of the reasons why so small a boiler as the one experimented upon, was found capable of generating so large a quantity of steam; for, taking the efficiency of moving surface as only equal to double that of stationary surface, the entire shell of the boiler—top, bottom, sides, and ends, becomes heating surface, and that of the best kind, being horizontal, and brought immediately over the furnace, which is usually made to extend under the entire bottom of the boiler.

In this arrangement the plates of the boiler can never become overheated, as however small the quantity of water in the boiler, the bottom is certain to be first covered, thus rendering explosion from this cause *almost impossible.*

It appears that the rotation of the shell and tubes of a boiler greatly retards, if does not entirely prevent, ordinary incrustation. The small experimental boiler now in the Exhibition, after being at work with very indifferent water for fourteen months, was examined at about six months' intervals, and found to be covered with a light dust on the inside, but to have no appearance of incrustations, although slight traces of this were found at those parts of the boiler which did not move, such as the feed-pipe, which is stationary inside the boiler. The singular manner in which many marine boilers have been affected, apparently by the action of acid formed in the greasy patches found on the sides of the boiler, and on the tubes, where surface-condensers are employed, has not been yet satisfactorily accounted for, but may partly be due to the scum floating on the water always being in contact with the same part of the boiler. It is more than probable that in the rotating boiler this evil will be entirely remedied, the whole surface of the shell being brought in contact with the scum, but for a very short time only as regards any one part of it. Experience is, however, wanting on this point.

As regards the employment of this class of boiler for ships of war, and especially for iron plated ones, it possesses two important advantages; first, it being a very low boiler, the largest size not extending 10 ft. in height, and secondly, its weight, with water and casing complete, not amounting to one-half that of ordinary marine boilers, even allowing the same heating surface, which, as has been stated, will probably be found to be three, or even four times more than necessary. Its size is also very greatly diminished, as will be seen from the following particulars:—

An ordinary marine-boiler, having about 1,400 feet of effective heating surface, occupies a space of 10 ft. 6 in. by 11 ft. 6 in., and is 16 ft. 6 in. high, weighing with water $31\frac{1}{2}$ tons. This gives about 51 lbs. per square foot of heating surface, and 1-10th of square foot of floor space occupied per square foot of heating surface. On the other hand, a revolving boiler having upwards of 1,600 ft. of heating surface occupies a space of 9 ft. 6 in. by 7ft. 4 in., and is 9 ft. 7 in. high, occupying thus only 1-25th of a square foot per square foot of heating surface, weighing with water 13 tons, equal to 18 lbs. per square foot of heating surface.

Thus, assuming for the moment that a square foot of heating surface is equally efficient both in the ordinary marine and the rotating boiler, it will be seen that the rotating one is less in every way, viz.:—

In weight about one-third.
In bulk about one-fourth.
In height about one-half.
In floor space about one-half.

With the revolving surface only doubly as effective as stationary surface, these advantages would be just doubled, and if experience in future justify the conclusions already arrived at, one-third of the whole amount would be the relative weight and space occupied respectively by a rotating boiler of equal power to a common marine one.

One word, in conclusion, as to consumption of fuel. On this point results of experience cannot be given, inasmuch as the boiler now in the Exhibition is too small to lead to enable conclusions to be formed. It is 18 in. in diameter only, and 18 in. long, but it has converted into superheated steam 7½ lbs. of water by the consumption of 1 lb. of coals. In larger boilers there can be no doubt that a good result will be obtained, owing, first, to the small quantity of water contained in the boiler, and consequently to the rapidity with which the steam is raised, and secondly, owing to the steam being in contact with one-half of the whole heating surface, thus leaving the boiler highly superheated.

The decrease in weight and size, and consequently diminished cost; freedom from excessive wear in any one or more of its parts, the wear being quite uniform; the strongest possible form and freedom from liability of explosion from this cause, as also from uniformity of wear and tear; simplicity in manufacture and repairing. Everything seems to recommend this boiler as a most suitable high-pressure one for steam-vessels.

In order to ascertain thoroughly what advantages can actually be realized in practice, a boiler of 30 nominal horse-power is now being constructed by Messrs. John Stewart and Son, of the Blackwall ironworks, and which, after being fully proved upon land, will be placed on board a vessel to be subjected to the ordinary usage of marine boilers.

The accompanying diagrams represent a flue-boiler of 23 nominal horse-power, exhibited at the International Exhibition, Western Annexe. It differs from marine boilers of the same principle, only for having 4 in. internal flues instead of 3 in. tubes on Dr. Grimaldi's plan, and exhibited by the inventor at the International Exhibition, Italian department, Western Annexe, No. 1,001. Fig. 1 is a longitudinal section taken through the centre of the boiler; Fig. 2 a transverse section taken at M. M. From the fire-grate T the fire passes over the surface of the boiler R, and through the interior of the four flue tubes o. o. The boiler is fitted with the fore and aft trunnions *s* and *u*, which turn in bearings; *q* is the feed-pipe, and *c* the steam-pipe. The feed-pipe is kept in its place by means of the cross and side bars *i* and *v*. The trunnion *u*, enclosing the combination of the feed-pipe *q*, is turned by a worm and screw or any other similar mechanism. The driving power required is very small, as the boiler makes but one revolution per minute; *a* is the water gauge, which acts like a syphon, *c* is the steam guage, *Q* is the masonry, *t* the furnace, *l l* are two sets of bricks preventing the flames from overheating the top of the boiler when not in motion.

The chief dimensions and particulars of the boiler exhibited by Dr. Grimaldi, are as under:—

Diameter of the boiler 4 ft., length 8 ft. 6 in., plate 7-16ths.

Diameter of flues 1 ft. 2 in., plate ⅜.

The boiler has been tested at a pressure of 200 pounds per square inch, and with safety stands a working pressure of 75 pounds per square inch.

This construction of boilers, unlike the Cornish ones, is adapted for the consumption of every kind of fuel, and is well suited for marine purposes.

CLEGG'S NEW PATENT WATER METER, WITH KRUNSCHRŒDER'S IMPROVEMENTS.

FIG. 1.

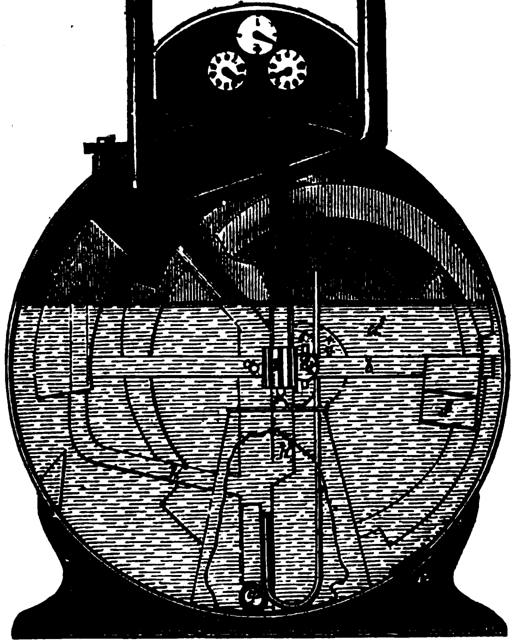
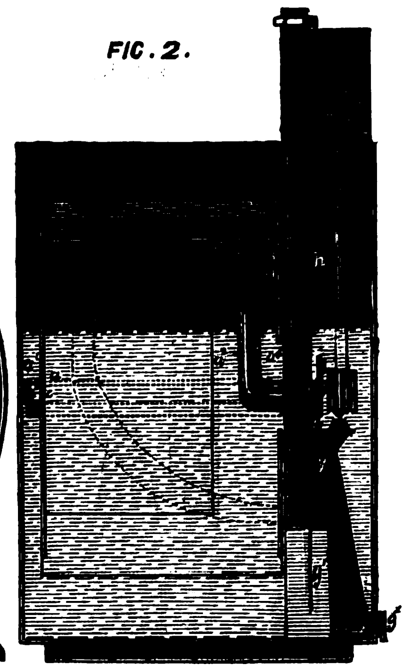


FIG. 2.



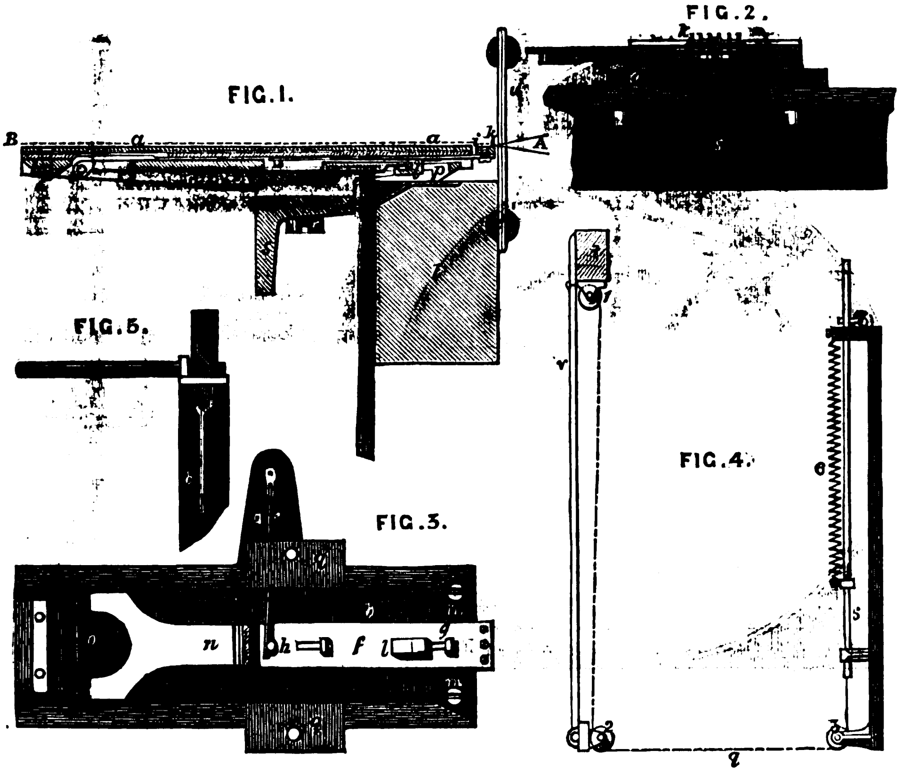
CLEGG'S NEW PATENT WATER METER, WITH KRUNSCHRŒDER'S IMPROVEMENTS.

THE above gas water meter is shown in the International Exhibition, No. 6,283, Section B, Class 31, being manufactured by the firm of Bischoff, Brown, and Co., of Langham Works, George-street, Great Portland-street, London, W., the successors to, and improvers on, the late Mr. Samuel Clegg's various patents in gas engineering. Mr. Samuel Clegg, as is well known, devoted his great abilities for nearly half a century to the improvement of gas apparatus, having taken out his first patent for a water meter in 1815. Having, in the mean time, tried various plans for dry meters, he at last, in 1858, two years before his death, returned to the improvement and perfecting of the water meter.

To effect this he found that the registrations required to be rendered independent of any variation of water level, caused either by evaporation, wilful abstractions, or an undue adding thereto of water. Mr. Clegg having died before he had fully carried out his ideas, the meter, as represented above, has formed the subject of a patent of a gentleman formerly in his employ, and now in that of Messrs. Bischoff, Brown, and Co.

Fig 1. shews a front view of this meter, some of the details being in section. Fig. 2 shews a transverse section. It consists essentially of a drum, or series of eccentric chambers placed round a central air-vessel, which permits it to rise and fall according to the height of water in the case; that of the friction on the bearings is thus removed, and the meter can be solidly constructed. When the meter is once adjusted, it maintains the same measuring capacity under any alteration of the water level or variation of pressure. The hollow central part of the drum is closed at the back end; it has also a cover at the front end, which has a central opening through it. This opening is, however, below the water-level, so that the central portion of the drum is enclosed gas-tight. In the central portion of the drum is a hollow float, between which and the front end of the drum there is a space, into which the gas is conducted by a branch on the supply pipe, which enters the opening in the centre of the front end of the drum. The axis *a* of the drum is fixed in the centre of the back end a^1 of the drum, and also in the centre of the front end a^2 of the float. By these means the measuring drum is fixed to and carried by the axis *a*. The front end a^3 of the drum is, as before stated, closed at all parts excepting at the central opening a^4, which is at all times below the water level in the meter, both interior and exterior of the drum. The back end of the axis *a* of the measuring drum is received into a bearing or hole in the frame *b*, which moves in fixed axes or necks, *c c*, one of which is fixed at the back end of the meter, and the other is fixed near the front of the meter above the waste water box hereafter described. The frame *b* thus acts as a lever frame, the axis *a* of the drum being received and supported by the frame *b* on one side of its axes, whilst on the other side of these axes the lever frame *b* is affixed to an inverted vessel *d*, which acts as a regulator. This regulating vessel is open at bottom, and close at the top as well as at the sides. The front end of the axis *a* of the drum passes through a slot or slit in the lever frame *b*, by which as the frame *b* moves on its axes the front end of the axis *a* of the drum is capable of being at times at a greater distance from the axis of motion of the frame *b* than at others; but the axis *a* of the drum is at all times kept correctly in position by a vertical slit or slot in the plate or frame *e* above the overflow vessel, which vessel is formed at the front end of the meter: *f* is a weight which is applied to the frame *b*, and is capable of being slid thereon, and of being fixed in any desired position. This weight is used to adjust the correct working of the regulating vessel and the measuring drum. The water level shown in figure 1 of the drawing is that when the frame *b* is horizontal or nearly so. The water line in the meter may at times be higher or lower than that which is shewn in the diagram, but never so low as to come below the upper part of the opening a^4 formed at the front end of the measuring drum, otherwise the gas would pass out through the opening a^4 into the case of the meter; *g* is the overflow vessel or waste water box, which is at the front end of the meter. This vessel is divided by a partition at g^1, as shown at Fig. 2. by which arrangement water will at all times be in one part of the overflow vessel up to the top of the partition g^1, which will cause the lower end of the gas supply pipe *h*, which is open, to be constantly closed or covered by the water in such manner as to prevent gas passing from the supply pipe *h* into the waste water box *g*. Any water which may overflow the partition g^1 can be run off by the plug-hole g^2 when desired. The gas supply pipe *h* enters the meter at the upper part, and at the front end of the meter the pipe *h* is bent, and, as before stated, enters into and descends to near the bottom of the overflow vessel *g*. The gas supply pipe *h* has two branches h^1 and h^2; the branch h^1 passes laterally till it comes under the front end of the inverted vessel or regulator, then the pipe ascends in an inclined direction, so as to come above the highest water level at the back end of the inverted vessel, leaving, however, a distance between the upper end of the pipe h^1 and

COURTAULD'S IMPROVEMENTS IN POWER LOOMS.—(*See page* 275.)



the inner surface of the back end of the inverted vessel, so that that vessel may rise and fall freely in the water without touching the upper end of the pipe h^1, where it comes above the water level within the inverted vessel or regulator. By this means it will be evident that the regulating vessel will at all times be filled with gas above the water level of the meter, and the rising of the regulating vessel will tend to depress the axis a and the measuring drum. The effect of this tendency to depress the axis of the drum is regulated by the position of the weight on the lever frame b, before mentioned. The effect of the branch pipe h^1 inclining from the front to the back end of the inverted vessel will be to prevent any gas being taken from the meter by tilting the meter backwards, as by so doing the water in the meter would descend down the pipe h^1. The supply of water to the meter is introduced through the pipe i, which is applied at the front end of the meter, as is also the case with the gas supply pipe h, and also the outlet pipe; and at the upper part or top of the inverted vessel or regulator d is applied a flexible surface valve or stop, which when it comes against the inner end of the outlet pipe j will stop the passage of gas out of the meter. The gas from the supply pipe passes to the measuring drum through the branch pipe h^2, which enters the opening a^4 in the front end of the drum, and rises to the height of the proper highest water level of the meter, so that it will be understood that this branch h^2 rises to a height somewhat less above the water than the branch h^1, which rises to a height somewhat above the highest water level in the meter. The water in the meter will be prevented standing above the top of the branch pipe h^2, as the water will, when it comes to the top of such branch h^2, flow down through into the overflow vessel; k is a worm or screw on the front end of the axis of the drum, which takes into and drives the long pinion l, which is on the axis m, by which the number of revolutions of the measuring drum is registered in the ordinary manner. The water is drawn off from the meter at the plug-hole n.

General C. F. James, the inventor of the "James projectile," has died from a wound received from the explosion of one of his shells.

TO CORRESPONDENTS.

Received—J. H. B., D. G. F., W. A., J. B., P. Bros and Co., O. R. J., J. V. St. D., J. N., E. M., G. S., E. E. A., G. H. B., Capt. N., X. Y. Z., X. Q., A. R., R. T., F. A. P., B. C. A., J. H. G., F. A., J. N., W. H.

Correspondence.

[*We do not hold ourselves responsible for the opinions of our Correspondents.*]

DEFLECTIVE ARMOUR PLATES.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Sir,—Will you permit me to remind your valuable correspondent, "Civilian," that in one of his early letters he stated that any mistake of his would be readily acknowledged. His calling the systems of Mr. Roberts and Mr. Westwood angulated, I boldly state is altogether wrong; neither of these gentlemen's inventions have any claim whatever to be so called. Mr. Westwood's specification (No. 1,420, A.D. 1860), thus describes his system:—"The surface of the plate is corrugated, indented, grooved, or channelled to a depth of not less than two inches." This, be it remembered, on a flat upright iron plate; it was scored just as a butcher scores a loin or leg of pork, and the only effect was, the 4½ in. plate was reduced in strength to one of 2½ in.

Mr. Robert's patent (No. 3,011, A.D. 1806), shows his iron plate surface, or side of the ship, in the form known to ladies as crimped up; he crimped up the side, in ten angular projections, 2 ft. from centre to centre of each, with dogs teeth of tempered steel at the points; his idea was that "the effect of shot or shell coming in contact with the dogs teeth would be to smash or splinter the missile."

Now neither of these systems are angulated, much less deflective: sunk corrugated lines on flat armour whether made oblique or horizontal, are sources of weakness; and as "Civilian" justly remarks, "present protruding points to be more readily shot away."

Mr. St. John Vincent Day's plan is in no way a counterpart of either of the systems: he adopted my section, elongating, instead of rounding it, taking my size, twenty feet for the height.

It is only in his 15th letter that "Civilian" first uses the word deflection; he then mentions the system as having proved to be a mistake, and informs us that Mr. Westwood and Mr. Roberts had targets made under that principle, which have been tested unsuccessfully. With all due deference to "Civilian," in appearance, he wishes to shelve all discussion on the deflective principle, by connecting it with two systems which have passed away, and which had no similitude whatever with it.

If flat upright iron plates for ships of war are to be ever made shot proof, their thickness must be measured in feet, not in inches; already plates of 8, 9, and 10 inches are talked of, although the "Warrior" is known to be a bad sea boat with an armour thickness of only 4½ inches.

"Civilian" has admitted, letter 17, that I am quite right as to the law of deflection. Now I beg to submit to his quiet consideration whether or not a target of twenty feet diameter in the form of a flat core, with a slightly curved lip, (the ancient arm bearing defence of Scotland) is not a far more sensible form to receive a heavy shot than a clumsey flat iron slab. He has always rightly made the fastenings and backing for armour plates matter of the greatest importance; the fastenings should be protected from impact of shot, while they should be capable of drawing the plates firmly to the backings; from both these points can be easily secured by conical shield armour. In fig. 8 of my specification drawing I show the fastening, (which, by the way, since its appearance has been twice patented by other parties). I made flanges by turning back the edges of the plates at right angles, and bolted them together, thus securing them from impact. The form of the shield allows the backing to be so securely pressed or forced against the inner surface of the plates, that should any portion of the latter be ripped or shot off, the backing would be pressed through the opening presenting a level surface.

I am, Sir, &c.,

34, Kensington-square, C. J. Richardson.
27th Oct., 1862.

DEEP-SEA CABLES.

Sir,—It is somewhat remarkable that all seamen who have hitherto ventured an opinion on the subject of deep-sea telegraph cables are unanimous in condemnation of the cumbrous iron sheathed cables hitherto in use, and join in recommending lightness, in so far as it is compatible with strength and durability.

The very interesting letter of Lieut. Davis, R.N., in your impression of the 17th inst., is an additional testimony to the soundness of the opinion long since formed by not a few thinking men who have made the subject their study, that the strength of such cables is in reality their weakness. The arguments used Mr. Davis are conclusive proofs thereof. And I dare say your readers have not forgotten the strain of playful satire with which Captain Selwyn treated those massive metal-mailed monsters, hitherto thought so desirable for submarine purpurposes, in his valuable paper on a new method of paying-out cables. One cannot peruse the evidence of the various seamen before the Government Committee without being struck with their unanimity on this point. There is the evidence of Admiral Fitzroy, for instance, at page 196 of the Blue Book, who cannot speak in too strong terms condemnatory of heavy iron cables. Is the evidence of men, so thoroughly competent to be correct judges as to the sort of cable most desirable for deep seas to be ignored? It seems to me that the very nature of their vocation eminently qualifies them to judge, and judge unerringly, on this matter, and, doubtless, so thought the Government Committee, else what is the meaning of the words relative thereto at page 35, Blue Book. None of the gentlemen referred to assume a knowledge they do not possess; they speak of the *outward* construction of the cable *and that only*; and do not venture on the debateable ground occupied by the electrician and ordinary telegraph engineer, nor have they any occasion to do so. It must be patent to every one that efficient protection of the core may be secured, without having recourse to that style of outward sheathing which is now the subject of animadversion. The position thus occupied is not unbecoming, and modest in the extreme, and is of itself a sufficient proof of their sincerity and competency, which under all circumstances is entitled to respect, nay, more, to adoption, since it is the result of years of matured experience.

Your correspondent may well be surprised that a second Atlantic cable should be projected on the same principle as the first. The true cause of the failure of the first cable was doubtless its great weight, although other causes contributed thereto which may or may not remain secrets; and it is hardly credible that the same company should entertain a second cable of a similar construction, especially as it must be of one unbroken length, which adds tenfold to the risk in submerging. If the cable could be laid in sections of 300 or 400

miles, the case would be different, and some justification would exist for persisting in giving the preference to a ponderous cable. As it is, however, seeing they will have none other than the direct route as before, and eschew the northern route utterly, we can only hope, and that confidently, that the good sense of the Government, and men of capital of this country, by looking shy on so wild a project, will by holding back the sinews of war prevent an additional half million being sunk uselessly in the depths of the Atlantic.

Yours obediently,

Walworth. S. TAYLOR.

PROPULSION OF VESSELS.

SIR,—Some time ago, you had frequently in your columns an advertisement of a new means of applying the force of steam for the propulsion of vessels. I refer to Mr. Parker's plan, which is, to send a jet of steam into a pipe which communicates with the sea at the stern of the boat, and which steam, in conjunction with air which goes in along with it, propels the boat. I have seen the plan at work in a 6 in. model, at the Crystal Palace, but this is on too small a scale. My object in writing is to ask if it would answer in a large vessel. I have a yacht with engine and screw in, to use in calms; but I find the screw to be a great drag when under sail, besides which the shaft lessens the head room in the after cabin. In Mr. Parker's plan there would be no drag; and by having the steam pipe low down, the loss of head room is not nearly so much. Of course, I do not think the plan *commercially* useful, but to preserve the sailing qualities of my boat, I should not objecct to burn the same coal per hour, and put up with less speed; I therefore beg to ask your opinion as to what speed I could get with 1 cwt. of coal per hour, supposing that, with my engine and screw, I now get eight statute miles? In Mr. Parker's plan, I should lose my blast from the exhaust steam which I now have.

October 28, 1862. X. Y. Z.

WOOD BACKING.

SIR,—Your correspondent, "Civilian," in last week's number of the MECHANICS' MAGAZINE, says, "Let it only be well understood that to project bolts made of hardened metal against iron plates is the same thing as to drive a punch through a boiler plate," and again, "the explosive force of gunpowder is the machine; the shot is the punch." He considers that the backing of tough wood in the "Warrior" is of little or no use, because a wooden plank would not be of any service in preventing a punch penetrating a boiler plate. Now although I am not of the "Warrior" party, I must beg to differ from this gentleman, for, in the instance of a shot and plate, the shot is propelled from the gun with a certain velocity, decreasing every moment after it leaves it; in the case of a punch and boiler plate the punch is moved by the machine with a uniform velocity all the time, and so if nothing has power to stop it altogether, it will go on and perform its work, whereas, in the former case, the shot having no power to propel it except its momentum, would certainly be decreased in velocity by the friction in passing through an iron plate some inches thick, and the wood, *if there be enough of it,* would finally stop it altogether.

Q. X.

HORIZONTAL-STEERAGE OF BALLOONS.

SIR,—In order to direct balloons *horizontally and at pleasure,* I propose fixing *wings* on each side of the car, (in perfect imitation of *bat's* wings) to be acted on by mechanical power in imitation of nature. The turning of a winch will give motion to a small wheel, that to another on the right and left, giving play to the two wings. The person who turns this winch is seated at the helm, guides at the same time a *fine spreading tale,* (as rudder) which may be moved with ease (as may the wings) in any direction, perpendicular, horizontal, or oblique. The wings to be formed of the finest and hardest steel, by allowing it with 1-300th part of *silver,* and covered with waterproofed crimson silk, of the strongest kind.

I am, Sir, yours faithfully,

JAMES BRUCE (late 33rd Regt.)

London, 27th October, 1862.

Gossip.

On Saturday last two additional lifeboats, on the plan of the National Lifeboat Institution, built for the Portuguese Government, had their harbour trial in the Regent's Canal Dock, Limehouse. They underwent most satisfactarily the usual testing of their qualities of self-righting, self-ejecting of water, and of stability. They will leave on board a steamer for the Peninsula. Six lifeboats, including the two in question, have been built within the last few months by the Messrs. Forrest, under the directions of Admiral Sir Gearge Sartorius, for the Portuguese Government. A lifeboat for the National Institution, intended for Drogheda, on the Irish coast, was also tried on Saturday, with an equally satisfactory result. She left London on Monday on board Messrs. Malcolmson's steamer for Dublin. During the past stormy week some of the lifeboats of the National Lifeboat Institution have, in addition to assisting several vessels into port, saved twenty-two shipwrecked sailors from different wrecks, who must otherwise in all human probability have perished. Within the last two years and a-half the lifeboats of the institution have saved nearly 800 sailors on various parts of our coast.

Messrs. Peel, Williams and Peel, Soho Foundry, Manchester, have completed the forging of the largest wrought-iron shaft ever made in that city. The shaft is 29 ft. 7 in. long, by diameters varying from 18½ in. to 22½ in., its weight being nearly 12 tons. It is to replace a cast-iron shaft which has broken in one of Messrs. Wren and Hopkinson's huge water wheels, now being repaired by that firm. The shaft is made from scrap iron, puddled in a ball furnace, and wrought into density and its present form by a belly-elve hammer, which is capable of striking a blow equal to a force of six tons, and yet can be so nicely regulated by a steam throttle valve as to give the lightest blow which may be required, while at the same time its speed may be varied from 4 to 40 strokes per minute. The shaft is considered to be a remarkably clean piece of workmanship.

It is said that the Italian Government have contracted with the Millwall Ironworks for a war steamer of 2.030 tons, fitted with cupolas on the principle of Captain Coles. The engines of 700-horse power are to be by Messrs. Maudslay and Company.

It is proposed to extend the Helmsley and Ryedale Railway.

The Bristol Docks committee have brought up a report, in which they recommend the adoption of Mr. Howard's plans for the deepening and straightening of the river, so that two large paddle steamers could pass each other at any part on a neap tide, cutting through the "Horshoe point," and making a new steam basin near Cumberland Basin large enough for ocean steam traffic. The estimated expence is £557,495, the interest on which it is intended to provide for by the surplus revenue of the Dock and Wharfage estates, by small dues on corn and provisions, and tonnage dues on ships in harbour over two months. An alternative plan by Mr. Howard was estimated at £409,275. Both of the plans will be discussed at the next meeting of the Town Council.

Messrs. Glass and Elliot in a communication to us, say: We are perfectly confidant that a good and durable submarine cable can be laid direct from Ireland to Newfoundland, and are willing to undertake the contract upon the following conditions: 1. That we shall be paid each week our actual disbursements for labour and material. 2. That when the cable is laid, and in working order, we shall receive for our time, services, and profit, 20 per cent. on the actual cost of the line, in shares of the company, deliverable to us in twelve equal monthly instalments, at the end of each successive month whereat the cable shall be found in working order. We are so confident that this enterprize can be successfully carried out, that we will make a cash subscription for a sum of £25,000 sterling, in the ordinary capital of the company, and pay the calls on the same when made by the company. Annexed we beg to hand you, for your guidance, a list (which appeared in the MECHANICS' MAGAZINE, March 7, 1862, p. 159), of all the Submarine Telegraph Cables manufactured and laid by our firm since we commenced this branch of our business, the whole mileage of which, with the exception of the short one between Liverpool and Holyhead, which has been taken up, is at this time in perfect and successful working order. The cable that we had the honour to contract for, and lay down for the French government, connecting France with Algeria, is submerged in water of nearly equal depths to any we should have to encounter between Ireland and Newfoundland. You will permit us to suggest that the shore ends of the Atlantic should be composed of very heavy wires, as from our experience, the only accidents that have arisen to any of the cables that we have laid have been caused by ships' anchors, and none of those laid out of anchorage ground have ever cost one shilling for repairs. The cable that we should suggest for the Atlantic will be an improvement on all those yet manufactured, and we firmly believe will be imperishable when once laid.

Mr. Murray, of 7, Gloucester Cottages, Park-road, Peckham, in a letter says:—"In your impression of the 17th instant, in the description you give of Murray's Chain Pump, you say they have plates of wood. I beg to state they are plates of iron, with steel edges called lifts."

Mr. William Austen, of Milford, says: Your correspondent "Civillian's" letters in the two last numbers are much to the purpose, and show he has taken a great interest in the subjects he handles so well. I have lately proved the theory and practice of round and flat end projectiles by relative stages with punches and sledge hammer blows on iron plates placed on the anvil over *orifice,* and also on the *solid anvil face.* The last proves necessity of backing far superior to that which wood side grain would afford. I have suggested wood end grain as a backing, and also sand rammed hard, which is the nearest rigid backing to iron itself that I can think of. It is a well known fact that iron would be (in pig ballast or blocks) the best backing to armour plates, but it would conduct vibration on shocks, and the weight would never do for ships' armour, for they would turn upside down in a rough sea. The superiority of flat end plugs or sections of steel bolts or columns for destruction of enemy, beyond that effected by round canon balls of lead or iron, is proved by practical trials I have made, and which shows we have been firing the pills instead of the boxes, if I may use such a simile; but such is the fact, and a few experiments with steel plugs and 68-pounder guns would soon prove the *best* and *worst* armour plates and backings.

Mr. A. Rosse, of Walden House, writes:—Perhaps some of your readers can tell me where velocipedes are to be purchased? I mean good ones, upon three or four wheels. In some localities, I have been told, they abound, but I have never been fortunate enough as yet to meet with a really strong, well-made machine. I live in hope of such things becoming more common.

Captain Porter writes: I always read the letters of "Civilian," so ably written, in your Magazine. From what he states in his letter of Friday last, I suspect he is not aware that I proved in the barrack square of the 1st Horse Guards, then commanded by Colonel Hall, now General, and in presence of his whole regiment, that I pierced a steel cuirass with a flat-fronted steel elongated shell, discharged from the rifle barrel of Staudenmeyer's air gun. Lord Orkney turned in his lathe at Taplow this steel shell at my request, and was present and delighted at its execution.

On Monday last an important addition to the fire extinguishing apparatus, at the disposal of the fireman in the International Exhibition, was made in the form of a new patent steam fire-engine, placed near the Cromwell-road entrance. This engine, which is by Shand and Mason, of Upper Ground-street, Blackfriar's-road, is similar to one belonging to the London Fire Brigade, which was worked before the Jury, Class 8, on the first of July last. The report of the lately published summing up is as follows.—"The steam pressure was well-sustained, and continued working the entire day, without accident, concluding in the evening by throwing a good vertical jet." The engine has since the above trial worked most successfully at fifteen fires. Messrs. Shand and Mason have, we understand, made great improvements in the boiler of this machine, so that in the engine now in the Exhibition, steam of 50 lbs. pressure can be readily obtained in twelve minutes from lighting the fire, cold water being used, and at this pressure effective work can be done, the full working pressure being from 80 lbs. to 100 lbs. on the square inch, when 200 gallons per minute is pumped through an inch jet pipe to the height of one hundred and fifty feet; the weight of the engine does not, we believe, exceed 33 cwt., and this with the hose and firemen is conveyed rapidly to a fire by two horses. We trust that this engine will not be called into requisition during its short stay in the Exhibition, but as the most da gerous period with regard to fire will be when the packing and removing goods is going on, we congratulate Captain Bent and the fireman upon having such a powerful agent at their disposal.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the Proprietors of this Magazine. Other Papers are hereby warned not to produce them without an acknowledgement:—

STEAM ENGINES, &c., 952, 956, 963, 979.
BOILERS AND FURNACES, 940, 988.
ROADS AND VEHICLES, including railway plant and car-

929. G. COLLIER and J. COLLIER. *Improvements in looms for weaving carpets and other pile fabrics.* Dated April 2, 1862.

This invention consists in a new arrangement and combination of mechanism for inserting and withdrawing the pile wires in weaving carpets and other pile fabrics, whereby greater simplicity and accuracy of the working parts are obtained, so that the loom is enabled to run at a quicker speed. The wires are withdrawn from the fabric by means of a hook mounted on or fixed to a carriage capable of sliding to and fro on a guide rail, and they are inserted into the shed by an instrument which may be called a spring clip, and which is also guided in its to-and-fro movement by an inclined rail or slot, which the patentees prefer to be fixed at one end, and capable of slight movement at that end nearest the fabric. The withdrawing and inserting instruments are connected together in such manner that they move simultaneously to and from the fabric, and the wires are transferred from the hook to the spring clip by means of the inclined guide rail or slot before named, which forces the spring clip on to the wire head, whilst the latter is still held by the hook, and just before the wire has been completely withdrawn, the hook being freed from the wire head immediately the return motion is given for inserting the wire. When the wire is inserted into the shed, the lay beats it up to the fell of the cloth, where a catch holds it in position to be woven in. The point end of the wire, when withdrawn from the fabric, is carried opposite the open shed by a lever having a recess in its upper end, capable of receiving and sustaining the wire, the lever being operated by a suitably-shaped cam, so as also to support and guide the wire during insertion. *Patent completed.*

930. B. BLACKBURN. *Improvements in apparatus for lubricating locomotive and other axles.* Dated April 2, 1862.

These improvements have reference to a previous patent granted to the present patentee, and dated 13th June, 1861, No. 1,524, and are as follows:—Instead of placing the packing or stuffing used for spreading the oil on the journal below the journal, it is fixed above the centre of the journal, and in contact with it, and in such a position that the packing and the brass bearing shall wear away simultaneously together, and thus the packing remain always in contact with the upper part of the journal as long as the bearing lasts. *Patent completed.*

931. S. HUNTER. *Improvements in anchors.* Dated April 2, 1862.

This invention is not described apart from the drawings. *Patent completed.*

932. T. MOORE. *Improvements in winding apparatus, especially applicable to fishing lines and log lines, and in leaders or travellers to be used therewith, which leaders or travellers are also applicable to working ships' sails and other purposes.* Dated April 2, 1862.

This invention is not described apart from the drawings. *Patent completed.*

933. J. T. LOFT. *Improved machinery for printing in colours.* Dated April 2, 1862.

This consists chiefly in a novel mode of applying the colours to the set or series of printing surfaces which together constitute the design to be printed. The patentee proposes to employ both raised and sunk printing surfaces, but in general he prefers to operate with raised surfaces, the invention being most applicable to block or type printing. The paper to be printed he provides by preference, in the form of a roll, which he mounts on the tympan of the press. For printing in three, four, or more colours, he provides, say three plates or forms, which together constitute the compliment of the design to be printed. These he arranges side by side on the sliding bed of the press, and at such distances apart as will ensure their giving a proper register. On a level with this bed, and close beside it when the bed is at its backward reach, he places an inking or colour table, the surface of which is composed of detached parallel slabs. A traversing inking roller receives the colours delivered simultaneously from a series of fountains set at the end of the table, and thus charged, it is passed over the table, receiving in its passage a slight endway motion for the purpose of spreading the colour the more evenly. From the inking table the inking roller passes to the printing surfaces, and imparts to them at one operation broad or narrow lines, as the case may be, of the various colours with which it is charged. *Patent completed.*

934. W. CLARK. *An improved apparatus for manifold writing.* (A communication.) Dated April 2, 1862.

This relates to an improved manifold writer for obtaining copies of deeds, documents, or papers, letters, music, &c., by a single penholder, bearing at one time on several sheets of paper. The copies may also be obtained in triplicate. The apparatus and its accessories consists, first, of a desk or table of desired form, forming a support for the hand. Second, of an improved holder for steel or other pens. Third, of an improved inkstand, forming an indispensable adjunct to the penholder, as does the letter to the desk or table. *Patent completed.*

935. W. LEOPARD. *Improvements in railway-brake apparatus.* Dated April 2, 1862.

This relates to the application of self-acting brakes; that is, brakes in which the momentum of the carriage is utilized to produce the power applied, and consists in an arrangement of parts whereby the power is transmitted from the shaft receiving the impulse from the running wheel axle of the carriage to the brakes. We cannot give space to the details of the invention. *Patent completed.*

936. W. CLARK. *Improvements in the manufacture of carbonic acid.* (A communication.) Dated April 2, 1862.

This improved process for the manufacture of carbonic acid is as follows:—The inventor takes two parts of filings and one of copper turnings, and roasts them to a deep red heat on the sole of a cast iron retort (open at the two extremities) under the action of the current of air which is established; the copper rapidly absorbs the oxygen, and is transformed into oxide of copper. When the whole of the copper is converted into a black powder it is taken out of the retort and allowed to cool, and about 6 per cent. in weight of finely pulverized charcoal added to it. The mixing may be effected either with a shovel or by slight trituration; or, lastly, by adding the charcoal diluted in water in the form of a clear solution, and then allowing the whole to dry in a furnace. The mixture of charcoal and oxide of copper is then placed in the retort, and the carbonic acid begins to disengage at a slightly raised temperature, which continues until the whole of the charcoal of the mixture has been consumed by the oxide of copper, and the gas is then collected in a gasometer. About 250 lbs. of the mixture will furnish 50 lbs. of carbonic acid, equal to 10 cubic yards. When the operation is over the retort is opened at both ends, and the copper which has furnished the oxygen to the charcoal receives a fresh supply from the atmospheric air, and thus becomes revivified with the greatest facility. It may then be removed from the retort, cooled, and mixed with charcoal, and then made to undergo a similar treatment to the foregoing for producing the same result. The copper should be washed from time to time in plenty of water, in order to remove the carbonates of salts resulting from the combustion of the charcoal. *Patent abandoned.*

937. G. REBOUR. *A permanent autographic log serving to measure, and if needed to retrace graphically the swiftness and sailing of a ship, the rapidity of streams, and the propelling of rising and ebbing tides.* Dated April 3, 1862.

This permanent autographic log is essentially composed of an archimedian screw, fixed on the quarter near the stern of the ship, and sufficiently below the water line to secure constant immersion. The furrow or thread and the size of this screw are so calculated that it may make one complete revolution for each unit of measurement run by the vessel. The axle of this screw, which is only to turn in one direction, is furnished with toothed gearing at an angle of 45 deg., which communicates the rotary motion of the screw to a horizontal shaft passing within the ship, the other end of which transmits it to a vertical shaft pivotting in sockets. At the point where the observation is to be taken is placed, tangentially to the vertical shaft, the handle of a striking index, balancing easily on its fulcrum, and running on the ridge of a prismatic circle perpendicularly to the vertical shaft. At some point of its circumference, this circle presents a section cut perpendicularly on one side, and following an inclined plane on the other; opposite this section is placed a gong or sounding plate, on which the hammer or index strikes when falling into the solution of continuty of the circle. With this instrument the officer of the watch has but to listen for a minute how many times the gong has been struck, to know that the ship has run a certain distance, and that without possibility of error. *Patent completed.*

938. W. HELME. *Improvements in firelighters.* Dated April 3, 1862.

The patentee claims, 1, constructing fire-lighters out of the waste blocks of wood, either singly or combined, from which cylindrical pieces for forming bobbins, reels, &c. have been extracted, so that the whole of the remaining portion remains connected together. 2, The construction of fire-lighters, wherein a number of incisions are made in a solid block or wood, so that a number of projecting pieces are formed which remain connected together, by reason of the incisions not having been cut right through the block, as described. *Patent completed.*

939. R. MORTON. *Improvements in refrigerators or apparatus for cooling liquids, parts of which improvements are also applicable to distillation, surface condensation, heating air for blast furnaces, and other similar purposes.* Dated April 3, 1862.

This relates to refrigerators in which flattened or other shaped tubes are used for cooling liquids, worts, or other fluids. In these refrigerators the hot water or other liquid enters the box or case at the opposite end to that at which the cold water enters, passes underneath one pipe, rises to its level, and then falls over the next pipe, and so on alternately over one and under the next to the end of the apparatus, where it flows into a reservoir at the end, and from thence into the tun, the cold water passing away at the opposite end. The patentee by preference uses flattened tubes made of copper thoroughly tinned, or other suitable metal or otherwise; these tubes are strengthened internally with a sufficient number of stays properly fixed the full length of the tubes. These tubes are inserted at each end into strong plates of copper or other metal, perforated at proper distances to receive the tubes, which are then connected alternately with hollow caps, or discs of copper or other metal secured to the plates, and over the ends of two or more tubes, so as to admit of a continuous flow of cold water or other liquids through the tubes. A longitudinal rib is fixed on the top of each alternate tube of sufficient depth, and the bottoms of the alternate tubes are also connected by a corrugated strip of copper or other metal, thereby forming a series of compartments between the tubes, causing a continuous flow of hot worts or other liquids alternately under and over the external surfaces of the tubes, the hot liquid and cold water thus flowing in opposite directions, and being discharged at opposite ends. The apparatus is fixed to a case of copper or other metal, and screwed in a strong wooden or metallic frame, and can be used with open or closed top to prevent any atmospheric action on the worts. Their action can be reversed if preferred, the worts flowing inside the tube, and the water outside the tubes. *Patent completed.*

940. G. BOWER and J. QUALTER. *Certain improvements in metallic pistons.* Dated April 3, 1862.

This consists, 1, in the novel application and use of a spring constructed similarly to a coach spring, and interposed between the interior surface of the V packing ring, and the wedges, screws, or other medium employed to expand the packing rings. This spring, composed of a series of plates, as a "coach spring," is the peculiar feature of the invention. 2. The invention consists in the novel use of a cam or cams, or eccentricities within the piston to act upon and expand the packing; their action being governable from the exterior or interior of the piston. *Patent completed.*

941. J. NEWTON. *Improvements in the construction of breakwaters, piers, and sea walls.* Dated April 3, 1862.

This consists in forming suitable hollow iron or timber casings, braced or stiffened, as may be required, which are lowered or placed on the bottom of the sea, or beds of rivers, &c. The casings are then bolted, rivetted, or otherwise fixed and secured together. The further ingress of water is then prevented by clay and sheet lead, or other substances, placed round the base of the casings when sunk. The water in the casings is then pumped or taken out to enable workmen to perform any operations. *Patent completed.*

942. G. HUNTER. *Improvements in machinery and tools for cutting, sawing, and planing stone, marble, and slate.* Dated April 3, 1862.

This invention consists in certain arrangements of machinery for mounting saws, surfacing plates, or other cutting tools, whereby they may be worked either vertically, horizontally, or at an angle; also in the constrnction of improved tools to be used therewith, or with any other stone-cutting machinery. The spindles of the surfacing plates or saws are mounted in brackets capable of being turned to any angle with the length or the breadth of the stone to be operated upon. The stone rests upon a turn-table, which lies upon a table having a traversing motion imparted to it, so as to feed the stone forward when sawing or surfacing, and arranged in such manner as to be readily put in gear with a quick reversing motion, so as to travel like an iron planing machine when necessary. The turn-table has slots formed in it, and upon the under table are long slides, acted on by screws, having a number of holes in them, wherein to insert grippers through the slots in the turn-table for the purpose of securing the stone and the turn-table. The turn-table is worked by worm-wheel and worm, or by wheel-rack and screw, or any other convenient method. The machine is also provided with planing tools for the purpose of planing off the circular marks left by the disc, or, if for slate slabs, for planing them in the usual way, before or after sawing them. The patentee makes the tools of bent steel, the size of which is regulated according to whether the stone is to be cut through or only surfaced; one end of the bent steel is worked bell-shaped, whereby the necessary angle is obtained as well as space for the tool holder. The tools may be semi-circular or flat, or pointed on the top side, according to the work required to be done. *Patent completed.*

943. R. M. TOOGOOD and J. LAYBOURNE. *An improvement in railway crossings.* Dated April 3, 1862.

This invention consists in forming welded cast-steel crossings by welding Bessemer or ordinary cast-steel rails from the point of the V or heart piece to the intersection of the two rails. *Patent completed.*

944. W. KEMP. *Improvements in the manufacture of silk pile velvet.* Dated April 3, 1862.

Here the patentee uses two pile warps, each having a complete number of threads. The warps are carried on two separate beams, and two pile warp threads (namely, one from each beam) are passed through each dent of the reed, and they make these two threads loop or pass over the wires alternately, that is to say, if one of these two threads loops or passes over the wire, the other is made to loop over the next. They also cause that portion of the pile warp, which at any moment is not engaged in making the pile loop, to pass on the surface of the fabric immediately under the pile loops formed by the other portion of the pile warps, so that the surface of the body fabric, the shoot of which may be of cotton, becomes coated with silk. In weaving velvet the patentees use only two shoots between the pile wires, and they still get a safe tie, as there are in fact four shoots between one loop and the next of the same pile thread. *Patent completed.*

945. M. AMOS. *Improvements in harrows.* Dated April 3, 1862.

Here the inventor forms numerous short bosses, each having a square hole horizontally through it, and in one surface of each boss a tooth is formed, and a tooth is also formed on the opposite side of the boss. These teeth he makes of different dimensions, in order that a harrow composed of these bosses may on one side have one class of teeth, and on the other side another class of teeth, and thus be suitable at different times to perform different classes of work. On to a square bar he places four or any other number of these bosses; and on the two ends of the bar he forms suitable hooks, eyes, or instruments for connecting the bars together end to end. He connects any desired number of these bars together end to end, according to width of harrow to be constructed. To connect together several of the rows of teeth thus produced, he uses chains which have square links at intervals in their length, according to the distance apart he wishes to have the severa

parallel rows of teeth; and before coupling the square bars end to end he presses such of the ends of these bars as may be required through square links of the connecting chains. By these means rows of teeth will be produced running in a direction from side to side of the harrow, and they will be connected by parallel chains running in a direction front to back of the harrow. *Patent abandoned.*

946. D. WILSON and E. A. COWPER. *Improvements in presses for pressing cotton, fibrous materials, and hay.* Dated April 3, 1862.

Here the patentees are able greatly to reduce the length of the trunk or box by making it with two of its sides (opposite the one to the other), capable of movement; these sides they combine with pressing apparatus, so that they become, in fact, the plungers of secondary presses. The box or trunk is filled with cotton or other fibrous materials, when its movable sides are most distant the one from the other, and when, consequently, the area of the trunk is considerably greater than that of the bale to be made; the first pressure is obtained by the inward movement of the sides, so as to contract the interior section of the trunk or box; the sides are then locked by suitable bolts or catches, and then the remaining pressure is effected by the piston or plunger of the principal press being, as heretofore, moved further and further into the trunk or box. *Patent completed.*

947. J. LEE. *Improvements in traction engines and boilers for traction, locomotive, and other purposes.* Dated April 3, 1862.

This consists in giving motion to the main or driving pair of wheels by a pinion on the crank shaft of the engine gearing into an intermediate wheel, on the axis of which is another smaller wheel, which gears into a toothed wheel on the axis of the main or driving wheels. The intermediate wheels turn on a stud which projects from the bracket, which carries the crank shaft; this stud, the crank shaft, and the axis of the main wheels are so placed that their centres are all in one vertical line. The improvements in boilers for traction, locomotive, and other purposes, consist in constructing them so that the horizontal tubes which pass from the fire-box conduct the products of combustion into a smoke box or chamber, from the top of which they pass away through vertical tubes, which rise up through the dome or steam chamber of the boiler, and on the exterior of the dome the tubes open into a chimney which can be turned down when the tubes require chimney. The smoke box or chamber above-named is formed by the plate, which receives the ends of the horizontal tubes from the fire-box, being bent at right angles, the portion bent down at right angles receiving the vertical tubes which rise up through the dome. *Patent abandoned.*

948. A. MANN. *Improvements in photographic apparatus.* Dated April 3, 1862.

This consists in certain improvements in photographic apparatus, being contrivances for obtaining an instantaneous exposure and closing of the lens, and for enabling the landscape photographer to secure impressions of clouds, or any desired atmospheric effect, along with the darkest foreground on the same plate. The invention, among other features, comprises an improved apparatus forming a new photographic camera shutter for uncovering and covering the lenses more conveniently, and admitting the requisite amount of light in a much shorter time than by any existing arrangement. The invention is not fully described apart from the drawings. *Patent completed.*

949. W. A. RICHARDS. *Improvements in the manufacture of bags, and in fastenings and locks for bags, part of the invention being also applicable to purses, cigar cases, reticules, and other similar articles.* Dated April 3, 1862.

In manufacturing bags in which frames are used, the patentee first cements to the metal intended to form the frame, a tube of leather of larger diameter than is required to cover the metal, and he forces the excess of leather into the recess, hollow, or opening formed by or left in the metal for the reception of the bag body, so that the leather forms a lining to the recess. He provides or forms the edge of the bag-body with a cord or other material, or portion thicker than the substance or rest of the said body, and he introduces the corded or equivalently prepared margin into the recess or opening in the clothed metal, the edges or sides of which he next forces against or towards the surfaces of the margin. Instead of metal and leather other materials are employed in the manufacture of bags may be treated in like manner for the same purpose. We cannot give space to the details of the fastening. *Patent completed.*

950. H. T. HASSALL and M. BURKE. *Improvements in reclining or invalids' chairs, and in swinging or ships' chairs.* Dated April 3, 1862.

This invention is not described apart from the drawings. *Patent completed.*

951. J. F. WOODALL. *Improvements in ventilating carriages for common roads.* Dated April 4, 1862.

The patentee claims the application to carriages or vehicles for common roads wherein fresh air is admitted through openings formed in the front or sidet, or both, of the carriage, whilst the internal air is roused to escape either directly through an opening formed in the roof, or through an opening into a conducting tube, whence it passes out through an opening at the back of the carriage, the said openings for the ingress and egress of the air being either uncovered or more or less hidden by suitable gratings or ornaments, and either provided or not with suitable valves for regulating at pleasure the extent of ventilation as described. *Patent completed.*

952. J. C. KAY and W. HARTLEY. *Certain improvements in steam engines.* Dated April 4, 1862.

This consists in certain arrangements of the air pump, condenser, and hot well of horizontal and other condensing steam engines, and of the suction and delivery vales in connection therewith. The objects of the improvements are, by increasing the effective condensing surface, and providing for the free discharge of air and water, to secure a good vacuum, to simplify the mechanical arrangements for working the air pump, to economize space, to obtain greater stability, and to afford facility in obtaining access to the valves and various parts. The invention is not described apart from the drawings. *Patent completed.*

953. F. SPENCER. *Certain improvements in looms for weaving.* Dated April 4, 1862.

This has reference to that part of the loom known as the "letting off" motion, and consists in supplying the warp beam upon rollers, to which a positive uniform motion is given at every pick, or after every two or more picks. The motion for the rollers may be derived from the tappet shaft, or other convenient part of the lever, and as the surface of the warp bears on the rollers, it is evident that the motion given to the rollers will unwind a uniform quantity of the warp threads. In order to prevent the slipping of the warp beam, a weight may be suspended to a band passing over the ends of the beam. *Patent abandoned.*

954. W. RYDER. *Improvements in the construction of machines for forging metals.* Dated April 4, 1862.

This has reference to a previous patent dated 8th Feb., 1841. (No. 8,835.) In performing the present invention, the inventor makes the sockets in which the blocks work round. He also makes the bushes or bearings in which the eccentric shaft revolves of a comical form, and applies a screw net to each end of these bushes, by slackening one of these nets and tightening the other; each brush can be adjusted independently of the others, thus dispensing with the usual caps and bolts. The last part consists in making the lower part of the piece which communicates the motion from the eccentric to the block of a partially spherical form, instead of partly cylindrical. *Patent abandoned.*

955. F. C. BAKEWELL. *Improvemnnts in letter-printing machines.* (A communication.) Dated April 4, 1862.

This invention is not described apart from the drawings. *Patent completed.*

956. T. SILVER. *Improvements in governors for regulating the speed of steam and other engines.* Dated April 4, 1862.

These governors are composed of two parts, one part being rotated by the engine or machine to be regulated, and the other part by an independent engine, or any other convenient means of obtaining uniform motion; or, when not rotated, it may be connected to any convenient arrangement for obtaining uniform power of resistance. Wheel gearing is employed intermediately for converting the difference between the motions of the two parts composing the apparatus into a movement, by which the throttle-valve or other means of regulating the admission of power to the engine is effected. A fly-wheel is employed, and it may either be keyed fast upon the shaft when the shaft is free to revolve in the driving pulley and other portion of the apparatus; or, when the driving pulley is keyed fast to the shaft, the fly-wheel mounted thereon is, together with its portion of the apperatus, free to revolve and may revolve in one direction or the other within the limit assigned to it. *Patent completed.*

957. L. LINDLEY and F. TAYLOR. *Improvements in sewing and embroidering machines.* Dated April 4, 1862.

This invention is not described apart from the drawings. *Patent completed.*

958. H. FLETCHER. *Improvements in valves for hydraulic presses and in apparatus connected therewith, for making or pressing blocks or bricks of coal or other material.* Dated April 4, 1862.

Here the inventor employs a self-acting valve, such as a double or compensating valve, constructed of valves of unequal size, and he so arranges them that, when the pressure of water is exerted it tends to open them, and they compensate each other, except by the difference of their sizes. This difference or inequality is compensated by means of a lever and weight or spring, or by other suitable means, so that the valves may be kept to their seats or bearings, by a force which may be adjusted or varied as desired. *Patent abandoned.*

959. G. MOULTON. *Improvements in pentagraph machines, used for tracing or engraving rollers or cylinders employed in printing calicoes and other surfaces.* Dated April 4, 1862.

This consists, 1, in the use of a circular tool-holder, having a mortice for placing a number of points around the cylinder to be traced or engraved. The said circular tool-holder is formed either in an entire circle or a segment of a circle, and in both cases the tool-holder is supported at two parts, placed in suitable positions. 2, In constructing the supports or bars for carrying the said circular or segmental tool-holder; so that they may be parted asunder and made to travel in opposite directions for the purpose of reversing the patterns. 3, In raising and lowering the table which carries the pattern plate, instead of having it stationary as at present, for the purpose of regulating or adjusting the length of the levers from the cylinder to the pattern plate, and thereby enabling the sketch to be adopted to any slight differences required on the cylinders. 4, In forming slots in the vertical arms or levers, so that the patentee may employ different lengths of the bracket that carries the tracer carriage and its bar, and also the shaft that carries the ratio pulley, for the purpose of altering the dimensions. *Patent completed.*

960. A. WOODHOUSE and T. HUNTER, JUN. *Improvements in the arrangement of kilns and flues for burning bricks, tiles, quarries, and other like articles, and in utilising the waste heat of the said kilns, and in stoves for drying bricks, tiles, quarries, and other like articles.* Dated April 4, 1862.

This consists in the construction or arrangement of kilns for burning bricks, tiles, and other articles, and in stoves for drying bricks, tiles, &c., the object of the invention being to use the waste heat obtained from one or more kilns to heat the bricks, &c. in an adjoining kiln or kilns, and afterwards to conduct the said waste heat to stoves for drying bricks, tiles, &c. *Patent abandoned.*

961. A. J. HALL. *Improvements in instruments for drawing ovals.* Dated April 4, 1862.

This invention is not described apart from the drawings. *Patent abandoned.*

962. M. BUTCHER. *Improvements in apparatus for reefing and furling sails from the deck.* Dated April 4, 1862.

Provisional protection has not been allowed for this invention.

963. S. FIELDING, S. FIELDING, JUN., R. FIELDING, and T. FIELDING. *Improvements in valves and in apparatus for lubricating the same and other parts of steam engines.* Dated April 4, 1862.

This consists in a new arrangement of valve which is actuated by a rotary movement derived from the main shaft by toothed glaring, or by any other mechanical contrivance. *Patent completed.*

964. R. A. BROOMAN. *An improved case for holding balls and reels of cotton, silk, and other threads.* (A communication.) Dated April 4, 1862.

This case is formed of metal, ebonite, gutta-percha, or other suitable material, and with two compartments, each of which is provided with a cover, and kept separate by one division plate or bottom common to both compartments. Each cover has a hole formed in it for the passage of the thread from the ball or reel, and there is also a notch in which the thread is engaged to prevent it running back inside the case. Each compartment is made sufficiently large to contain one ball or reel of thread. The thread is kept clean, and is not liable to become entangled when these cases are used. *Patent completed.*

965. J. SCEALES. *Improvements in steering ships.* Dated April 4, 1862.

This invention is intended chiefly to apply to the steering of ships of great length, and consists in fitting one or more rudders on the sides of the vessel in addition to the ordinary rudder. The additional rudder or rudders when not at work enter a recess or recesses formed in the ship's side to receive them, in order that there shall be no projecting surface to interfere with the ship's way when the additional rudder or rudders is or are not in action. *Patent abandoned.*

966. W. E. NEWTON. *Improvements in the manufacture of iron and steel.* (A communication). Dated April 4, 1862.

The patentee claims, 1, The purification of crude pig or cast iron, and its direct conversion into cast steel or refined iron, by successive and alternate oxidations and reductions. 2, The use of steam as a chemical agent in the operation of the direct conversion of the metal into iron or steel, by injecting or passing the steam through the metallic bath, under pressure, in a reverberatory furnace, as set forth. 3, The simultaneous use of air and steam passed or forced through the fluid metal for producing oxidation in a reverberatory furnace, as set forth. 4, The simultaneous use in the same both of molten metal of a combination of air, steam, and gas, as described. 5, The use of reducing gases, acting in the interior of the fluid metallic bath, and alternately with the oxidizing agents or gases. 6, The employment of steam acting mechanically as a means of conducting air or gases as applied to the above operation of converting molten pig or cast iron into steel or iron. 7, The injection of coal dust, or pulverized charcoal, or carbonaceous matter, into the metal bath, for recarbonizing the oxidized iron, as set forth. 8, The arrangements of the reverberatory furnace with beds or vessels for containing the molten iron in duplicate, and mounting these beds or vessels on wheels or moveable frames, so that they may be moved in and out of the furnace, as described. 9, The use of a raised bridge for separating the moveable beds or vessels, and providing the said raised bridge with a layer of fuel for assisting the reducing operation. 10, The application of the charcoal cement for the formation of the beds of the moveable vessels. *Patent completed.*

967. W. E. NEWTON. *Improvements in pumps for ships' use and other purposes.* (A communication.) Dated April 4, 1862.

This consists in the arrangement of inclined valves or inclined seats, in combination with a horizontal or other suitable pump cyclinder, and with a piston to which a reciprocating motion is imparted by a sliding plate operated upon by a three-armed oscillating lever, whereby a pump is obtained which can be easily operated, and will throw a large stream of water, and in which sand or other solid matters that may be drawn in by the pump will be prevented from lodging on the inclined valves or seats, and obstructing the operation of the pump. Also in the use of hinged swinging bolts which are made to catch into slotted ears made on flanges that project from the bottom of the air vessel over the ends of the valve chest, which is placed on the upper side of the pump cylinder. By the above improvements the air vessel can be readily fastened and unfastened from the pump. A packing is provided for making an air-tight joint between the lower flange of the air vessel and the upper edge of the valve chest. *Patent completed.*

968. W. E. NEWTON. *An improvement in projectiles for ordnance.* (A communication.) Dated April 4, 1862.

This projectile is constructed externally of cylindrical or other form to fit the bore of the gun, and is hollowed out internally in taper form. By this means a sharp front edge of circular or annular form, corresponding with the bore of the gun, is made at the front end of the projectile, and a hollow passage is made clear through the projectile, which is provided at its rear end with a sabot or plug, which closes the aperture, and also assists in expanding the rear end of the projectile, so as to make it fit the bore of the gun. *Patent abandoned.*

969. J. NOCK and W. K. PRICE. *An improvement or improvements in gas cooking ranges.* Dated April 4, 1862.

This consists in lining the inside of such ranges with glazed tiles or slabs placed a slight distance within the outside casing, the effect of which is, that a much higher temperature can be obtained with a smaller consumption of gas. *Patent abandoned.*

970. J. D. HUMPHREYS. *Improvements in furnaces and machinery employed in the manufacture of compound fuel and other matters.* Dated April 4, 1862.

In carrying out one portion of this invention the furnace employed is constructed on the reverberatory principle, so that the heat beats down into the chamber (containing the substance to be heated), in its passage from the fire to the chimney. The substance to be heated is supplied into this chamber by a feed-wheel working air-tight in the crown of the furnace. In the chamber of the furnace is fitted a

agitator to keep the fuel constantly stirred while subjected to heat. At the bottom of the chamber is a worm which moves the heated fuel out as required by the moulding machine. Inside the crown of the furnace is fitted a light metal box, containing lead or other substance that melts at about the degree of heat that it is required to raise the furnace to; an ordinary governor is fixed above the furnace, the spindle of which is connected with a disc or plate that revolves in this melted substance. The rise and fall lever of the governor is connected to a large throttle-valve damper placed under the fire-door. The governor is driven by a friction-coupling, so as to allow it to stand still with the damper open when the substance in the box is hard, and to cause them to revolve and close the damper as soon as the substance melts. Or a blowing fan may be regulated by a governor on the same principle, and thus may the heat of the furnace be regulated. *Patent abandoned.*

971. M. Walker. *Improvements in breech-loading rifles and other fire-arms, and in ordnance.* Dated April 4, 1862.

Here the inventor constructs breech pieces for breech-loading riles without requiring screw actions or complications of levers, by cutting away or grooving out the stock at or near the end of the barrel, and fitting the same with a breech plug or piece for stopping the breech end of the barrel, capable of being turned on a centre to out of the same line with the breech end of the barrel to load the rifle, Thus the inventor has a breech plug made to enter the end of the barrel and close the same, which plug should be made in two parts, united by a joint, the pivot of which joint should protrude at each side of the plug and slide in slots at each side of the breech piece, and one part, that furthest from the end of the barrel when in a line with it, being capable of being turned on the said joint, and allow the whole plug to be moved so as to admit the charge, after which the plug is to be placed in its former position, closing the breech end of the barrel, ready for firing. He affixes the nipple in the barrel, and connects the barrel to the stock in the ordinary way. *Patent abandoned.*

972. W. Begg. *Improvements in consuming smoke, and in furnace bars and bridges for effecting the same.* Dated April 5, 1862.

This relates to the admission of air heated to a high heat at the bridge of the furnace, in order to produce the combustion of the smoke, and consists in making all the furnace hollow from end to end, or nearly so, and all in one length, whereby a great amount of heating surface is obtained to heat the air, and which becomes highly heated therein. The back ends of the bars open into the fire bridge, which the patentee makes altogether hollow, and forms numerous perforations therein over the crown, and in front (towards the furnace) near the top of the bridge. *Patent completed.*

973. H. J. Simlick. *Improvements in the manufacture of vesuvians or cigar lights.* Dated April 5, 1862.

This consists in the application of a piece of tube on the splint or piece of wood of which the stem of the vesuvian is made, and in applying the combustible material on the end thereof, instead of on the splint itself, by which the combustible material is prevented dropping off when ignited. *Patent abandoned.*

974. J. Colling. *Improvements in apparatus for reefing ships' sails.* Dated April 5, 1862.

In reefing sails, the patentee uses a roller on which he winds the sail as hitherto, which roller he disposes in front of the yard, so that the full effect of the area between the yards may be rendered available. He mounts and supports the roller by bearings from the yard; two of such bearings carry the pivots on which the roller revolves, while others carry blocks or sheaves, through which the reefing chains or ropes are led on to the rollers. These reefing ropes or chains have the effect of rotating the rollers, and also in assisting to hold the roller and yard in position to slide freely up and down the mast while reefing or unreefing the sail, by reason of the conduct by and effect of their leading blocks and bearing standards before-named. *Patent abandoned.*

975. A. Clark. *Improvements in the manufacture of revolving window-shutters and blinds in window sash bars and plates, also in apparatus used in such manufactures.* Dated April 5, 1862.

This consists—1, in the application of flat, coiled, or volute steel-tempered springs, combined with a barrel or case revolving upon an axis for rolling up the shutters. 2. Part of the invention refers to mortising holes through the laths of revolving shutters, to receive tapes or steel strips for connecting them together. The third part relates to the manufacture of sash bars and mouldings and brass stall-board plates. *Patent completed.*

976. L. Faconnet. *A new kind of tiles.* Dated April 5, 1862.

This comprises various features of novelty in the form of tiles, one being that, on a roof covered with them, no overlapping will be apparent; thus, if the roof be covered with scale or shell-shaped tiles, it will form a perfectly plain surface, as if made of one single piece. This is effected by giving the tile several real or apparent thicknesses, making it, for example, thinner at top and bottom than in the intermediate part, that which is alone visible when the tile is placed. These tiles are provided with certain ribs, notches, and grooves for strengthening, fixing, and carrying off water. *Patent completed.*

977. R. A. Kobitzoch. *Improvements in diving apparatus and apparatus to be used for working in deep water.* Dated April 5, 1862.

This consists in a method of constructing and arranging apparatus whereby the diver is enabled to remain for many hours under water, shut out from all communication with the atmosphere, and protected from the pressure and coldness of the water, and allowed to move about freely in all directions. The details are voluminous. *Patent abandoned.*

978. T. Critchlow. *Improvements in planing machines.* Dated April 5, 1862.

This relates to certain improvements in planing machines for planing metal, and consists in adopting to such machines two separate and distinct cutters, fitted to one and the same cross slide, the cutting edges of the cutters being placed in opposite directions, so that a cut will be made at each forward and backward stroke of the table. Suitable provision is made for bringing the proper tool into action at the end of each cut. Or instead of using two separate cutters, a duplex cutter may be employed, having one stem or shank, and two cutting edges in opposite directions. *Patent abandoned.*

979. B. Thompson. *Improvements in steam engines.* Dated April 5, 1862.

This consists in a method of constructing steam engines for the combined use of high-pressure power and vacuum power, with slides or valves so arranged or disposed as to effect the division of the steam with which the engine is served into separate portions, after such steam shall have given out its pressure power, as distinguished from its vacuum power, and so that a portion shall be suffered to escape and a portion may become condensed. *Patent completed.*

980. C. S. Duncan. *An improved method of an apparatus for ventilating, cooling, or suppressing fire in public and private buildings or rooms.* Dated April 7, 1862.

This arrangement consists essentially in an arrangement of pipes for distributing water over the roofs of buildings or rooms for the purpose of cooling them, or for extinguishing fire, and in carrying such pipes into every room of a warehouse or other building. *Patent completed.*

981. T. Smith. *Improvements in machinery for cutting and shaping screw-bolts and other articles.* Dated April 7, 1862.

According to this invention, the cutting tool for shaping the body of the bolt and squaring the bolt-head consists of a steel die with a hole through it of the diameter of the screw-bolt, and one end is furnished with cutting edges. The head of the bolt to be operated upon is held in a chuck attached to a spindle, to which motion is given by steam or other power, and the cutting tool is pressed against the screw-bolt by a rod acted upon by levers and weights. When the cutting tool is being pressed against the screw-bolt, the inner cutting edges reduce the body of the bolt to its proper diameter; and when the cutting edges come against the bolt-head, they square it up. As soon as the operation is completed, the attendant, by acting on a lever, draws the cutting tool away from the screw-bolt, which is then taken out of the chuck, and another one put in its place to be operated upon in the same manner. The point of the screw-bolt is then operated upon by a countersunk cutter, somewhat like the tool known as a rose bit, and a similar instrument is employed for rounding up or polishing the heads of the bolts. These instruments are necessarily pressed against the point and head of the screw-bolt, which is held in a revolving chuck; or the cutting instrument may revolve, and the bolt or other article may be stationary. *Patent abandoned.*

982. W. Simons. *Improvements in constructing ships or vessels.* Dated April 7, 1862.

The patentee claims, 1, securing the wooden planking to the iron frames or beams of ships or vessels by means of screw-bolts, or other bolts of iron or steel, partially coated with copper, yellow metal, or a combination thereof, substantially, as described. 2, Introducing diagonal metal bars or plates between the wooden planking and iron frames of ships or vessels, alone or along with reverse diagonal bars or plates on the insides of the frames, substantially as described. 3, Fastening to each other the outside planks of iron-framed ships or vessels with oblique or diagonal seam bolts, substantially as described. *Patent completed.*

983. A. Harris. *An improvement or improvements in the manufacture of gun barrels.* Dated April 7, 1862.

This invention consists in making gun barrels by welding together, by means of rolling, drawing, or forging a series of bars, having, by preference, nearly a wedge shape, that is, such a shape that, when a series of the said bars are placed together side by side, they have nearly the figure of a hollow cylinder or tube. *Patent completed.*

984. E. Welch. *Improvements in register stoves and fire grates, and in ovens and kitchen ranges.* Dated April 7, 1862.

This invention is not described apart from the drawings. *Patent completed.*

985. G. Haseltyne. *Improvements in lamps especially designed for burning hydro-carbon oils.* (A communication.) Dated April 7, 1862.

The first part of this invention consists in an improvement on the "Argand burner," by which complete combustion is effected without a "button," and with a short chimney, not exceeding three inches in length. Instead of the cylindrical wick tube of the Argand burner, several tubes are employed, being arranged concentrically in the form of a truncated cone, the upper ends nearly touching one another, and the lower ends being considerably separated, so as to admit a free access of air inside. And instead of the common button an inverted conical deflector is used, placed centrally within the space formed by the wick tubes. This arrangement makes a practical portable coal oil lamp. The second part of the invention consists in the use of separate serrated wheels for raising and adjusting the wicks independently of each other. *Patent completed.*

986. W. N. Nicholson. *Improvements in ranges and stoves.* Dated April 7, 1862.

This invention consists in forming the fronts, panels, plates, and doors of kitchen ranges, and the panels of stoves, of enamelled iron. The invention also consists in means of fixing such enamelled iron, by forming frames in cast iron plates, and fitting the enamelled iron therein without screw or rivet fastenings; also in casting hollow projections in the cast iron plates, for the purpose of screwing therein taps or other necessary appliances. The enamelled iron plates have apertures formed therein, previous to being finished, to fit over such projections. The invention also consists in an improved form of hinge for the doors in kitchen ranges. The inventor casts a hollow boss with, and extending nearly the whole length of, the door, whereby great strength is obtained, and the use of detached hinges, rivetted in the usual manner, is dispensed with. This boss fits between two lugs on the plate to which the door is to be hinged, and a pin is passed through the lugs and boss. *Patent abandoned.*

987. T. Jackson. *Improvements in pianofortes.* Dated April 7, 1862.

For the purposes of this invention a spring is interposed between the end of the sticker or jack and the hammer butt, which spring, when employed in the action of an upright pianoforte, tends to bring back the hammer. At the front of the hammer butt there is an additional piece or projection which rests on the top of the jack or sticker when the hammer is away from the strings. The spring passes by preference into and works in a slit in the upper part of the jack or sticker, and it also passes into and works in a slit in the projection on the hammer butt, and the upper part of the spring presses against a pin passed across the slit in the projection on the hammer butt, so that when the hammer rises to strike the strings the spring is deflected, and has a greater tendency to bring back the hammer, and it prevents the hammer rebounding when it is back from the strings. *Patent completed.*

988. J. Watremez. *Improved apparatus for indicating a deficiency of water in steam generators.* Dated April 7, 1862.

This invention relates to a novel arrangement of apparatus for ensuring attention to the undue depression of the water level in steam boilers, the principle of action of the apparatus being to provide a way through the melting of an easily fusible plug for the escape of steam when the water in the boiler has fallen below a certain level, but until the water has reached that level to provide against the possible fusion of the plug. The invention cannot be described without reference to the drawings. *Patent completed.*

989. J. Carrington. *Improvements in paving stables and stable-yards.* Dated April 7, 1862.

In carrying out this invention the inventor proposes to make bricks with rounded tops and edges which, when brought together and cemented in their places, will produce a grooved surface, and will give the horse a good foot hold, and the edges being rounded the animal will not be liable to injure his haunches when lying down. As both the top and bottom edges of the bricks are rounded either side may be placed uppermost. The bricks should also be arranged diagonally, so that the grooves by running all in the same direction may be easily kept clean by means of a broom. *Patent abandoned.*

990. W. Steven. *Improvements in apparatus for moulding or shaping clay for bricks or other like articles.* Dated April 8, 1862.

In apparatus constructed with a modification of these improvements, the clay in a moderately plastic condition is put into a pug mill, resembling in construction those in ordinary use. The bottom of the pug mill is made flat or horizontal, and there is placed in close contact with its under surface a kind of sliding block, moulded in horizontal guides, and made to slide backwards and forwards across the pug-mill bottom by means of a connecting rod and crank. This crank may be conveniently formed or fitted on the central vertical shaft of the pug mill, this shaft passing through the bottom of the mill, and through a slot or elongated opening in the sliding block, whilst the connecting rod is jointed upon a pin projecting down from one end of the sliding block. The sliding block is formed with, say, four matrices or moulds, and there are four corresponding filling apertures in the pug-mill bottom, a pair on each side of the transverse horizontal central line. The pairs of matrices are situated so far apart in the sliding block that, when one pair is coincident with the filling openings, and receiving clay, the other piece is out clear of the mill delivering the bricks. As each matrix moves outwards from its filling opening, a compressing piston rises from below, and reaches its highest point just as the matrix finally quits the filling opening, and the material in the matrix is thereby compressed against the under side of the pug-mill bottom. The pair of compressing pistons at one end are mounted in a slide moving in its own guides beneath the sliding block, and actuated by catches on the sliding block in such a way as to move through only a part of the stroke of the latter. The pistons are elevated and depressed by means of levers on a shaft, or on studs beneath, the movement being caused simply by the horizontal motion of the slide twining the levers over through a limited angle. The other pair of compressing pistons are actuated by similar details at the other side of the machine. After the compression, the sliding block continues to move outwards, and the pistons descend until they clear the bottom of the block, whereupon the motion of the piston slide ceases, and the sliding block passes onwards until it completely clears them. The bricks are then discharged downwards from ont of the matrices by pistons, which are made to descend from above by means of levers actuated by the movement of the block, like the levers of the compressing pistons; these arrangements being, of course, repeated at both sides of the machine. For the purpose of preventing the clay from adhering to the bottom of the pug mill, to the sliding block, matrices, and other parts, provision is made for maintaining these parts at an elevated temperature, and this has at the same time the advantage of hastening the drying of the bricks. *Patent abandoned.*

991. J. Brown. *Improvements in protecting the bottoms and sides of ships, and other entirely or partially submerged surfaces.* Dated April 8, 1862.

This invention consists in protecting the bottoms and sides of ships, and other entirely or partially submerged surfaces, with planks or sheets of iron, which have been previously coated or covered with an enamel or glaze, either on one or both sides, such glazed or enamelled plates being caused to adhere to the sides and other portions of the vessel desired to be protected by means of a suitable cement, such as glue, or other adhesive material or mixtures. The plates may also be attached by means of nails, screws, rivets, or other suitable means, but the patentee prefers the employment of adhesive materials, as before mentioned, and more especially of that known as marine glue. The enamel or

glaze with which iron or metal plates, or sheathing to be employed for the above purpose are coated or covered, is such as will resist the action of salt or fresh water, and will not easily be detached from the iron or other metal. *Patent completed.*

992. W. BEARDMORE. *Improvements in steam rams for naval purposes.* Dated April 8, 1862.

Under one modification or arrangement this steam ram consists of an iron-plated vessel, which is actuated by steam power in the ordinary way. This vessel has fitted in it one or more steam rams, which may be arranged at the bow or stern, or along the sides, in manner similar to the heavy guns of a floating battery. Each of these rams are arranged in the form of a powerful horizontal rod, which forms a long sharp-pointed ram for perforating the sides of an enemy's ship or floating battery. These rods are intended to be made very heavy, and to be driven outwards by one or more engines, a sufficient amount of velocity or impetus being given to them, either by means of large fly wheels, by gearing, or any other convenient manner. *Patent abandoned.*

993. H. LEVINSTEIN. *Lustering silk.* Dated April 8, 1862.

This invention is not described apart from the drawings. *Patent abandoned.*

994. J. WHITEHOUSE. *Improvements in the manufacture of metallic door and other knobs, and the ornaments of the pillars of metallic bedsteads and other articles of like manufacture, and in attaching metallic mounts to china or earthenware knobs and ornaments, and roses for knobs.* Dated April 8, 1862.

The patentee claims making the necks of the said knobs from sheet metal by raising or pressing in dies, and spinning and fixing or casting in the said necks a socket in which the screwed or square spindle of the knob works, the said necks being joined to the bodies of the knobs in the usual way. Also, fixing the screw or axis in the necks made from sheet metal, by raising and spinning by means of zinc or other easily fused metal, or alloy cast into the said necks after the insertion of the screw or axis therein. Also, making the ornaments of the pillars of metallic bedsteads from sheet metal by the processes of stamping or pressing and spinning, and joining the parts together by pressure, the said ornaments, when required, having a screwed socket fixed or cast in them, as described. Also, certain improvements in attaching metallic mounts to china and earthenware knobs and ornaments, as described. *Patent completed.*

995. The Honorable W. E. FITZMAURICE. *An improved construction of plating for ships, batteries, and other structures used for war or other purposes* Dated April 8, 1862.

This invention consists in plating ships, batteries, and other structures in such a way that water is introduced and confined between two plates, thus forming a part of the resisting material against shot, shells, or any other projectile force, in contra-distinction to using solid plates of iron, steel, or other materials. For this purpose, the inventor uses cases of iron, steel, or other material filled with water, and so contrived as to be capable of being, by any convenient arrangement, emptied or refilled at pleasure. *Patent abandoned.*

996. C. P. CARTER. *An instrument for inserting photographic or other pictures into or removing them from between the "mounts" of photographic albums, or other flat spaces into which the fingers cannot be inserted.* Dated April 8, 1862.

This invention has more particularly for its object the obviation of the difficulty experienced in placing photographic pictures or "cartes de visite" between, or especially in removing them from, the spaces formed in the "mounts" of photographic albums, owing to these spaces between the back and front of the "mounts" being so narrow that the fingers cannot be inserted into them to lay hold of the pictures. To effect this operation with facility the inventor constructs an instrument resembling generally a pair of pliers, but with the jaws gradually thinned down to an edge at their extremity, and more or less widened out. The inner surface of the upper jaw is made quite smooth, so as not to damage the surface of the picture. These surfaces are furthermore so formed that, when quite closed, they meet only at their extremity, so that when opened slightly the space between them, corresponding with the ordinary thickness of a cardboard picture, is as nearly as possible parallel, by which, as also by the roughening of the lower jaw, the instrument will hold the picture inserted between it quite firmly. *Patent abandoned.*

997. F. W. BREAREY. *Improvements in medicated cups or vessels for drinking purposes.* Dated April 8, 1862.

The first of these improvements consists in the formation of a cup or vessel upon a combined medicating principle, in and by which the medicinal qualities of steel, iron, ironide, or other suitable metal, metals, metalline, or their oxides, or mineral or mineraline, simple or compounded, and the tonic or aromatic qualities or medicinal virtues of bitter wood, bark, or other vegetable matter, are combined and imparted simultaneously to the water or other liquid contained therein. The drinking vessels formed upon this principle the patentee denominates "The Improved Medicated Steel Bitter Cup." The second improvement consists in the formation of a similar cup or vessel, the bowl of which is formed wholly of steel metal or mineral (antimony excepted), otherwise than when used as hereinafter described, or of metals or minerals compounded or alloyed with antimony, the inner surface of such bowl or cup, or vessel, being oxidised by the application of acids or ammonia, in and by which the water or other liquid contained therein is medicated by being impregnated with the medicinal qualities or virtues of the said metals or minerals. The drinking vessels formed upon this principle he denominates "The Improved Medicated Mineral Cup." The third improvement consists in the formation of similar cups and vessels in and by which the principle of galvanic action, obtained either in combination with the medicinal qualities above-mentioned, or otherwise. The drinking vessel formed upon this principle he denominates "The Improved Medicated Galvanic Cup." In applying the first-mentioned improvement, he makes a cup or other vessel in two or more parts, one portion being composed of metals or mineral, simple or compounded, and oxidised on the inner surface, and the other portion composed of wood or other vegetable matter possessing in itself the required bitter tonic or aromatic or other medicinal qualities, or impregnated or saturated therewith. The wood or vegetable portion is fitted to the metal or mineral portion so as to be water-tight when joined together. The water or other liquid then medicated, is then poured into the cup or vessel, where it comes in contact with, and is acted upon by, the oxidised surface or surfaces of the metal or mineral portion, and where it also comes in contact with, and is acted upon by, the surface or surfaces of the wood or vegetable portion; and the combined medicinal qualities of the metal or mineral, and the wood, bark, or vegetable portions are thus simultaneously imparted thereto. *Patent completed.*

998. E. H. C. MONCTON. *Improvements in timekeepers.* Dated April 8, 1862.

This invention consists, firstly, in novel methods of regulating the admission of air or gas at either or both ends of the tubes of atmospheric or gas clocks by means of stop cocks or screw cocks of various constructions, and of any suitable material attached to them, by means of which, by merely turning the screw, the ascent or descent of the air can be regulated to the greatest nicety, and thus a perfect timepiece can be obtained. *Patent completed.*

999. J. JAQUES, JUN. *Improvements in the instruments used in the game of croquet.* (A communication.) Dated April 8, 1862.

For the purposes of this invention, in order that the players may know which (if any) of the players balls have been played through any of the several hoops or arches, a marker for each player is used which is formed in a suitable manner to admit of its being readily placed on and removed from the hoops or arches, so that a player having played his ball through an arch or hoop will place his marker thereon, where it will remain till he has played his ball through another hoop or arch, when he will remove his marker from the hoop or arch previously marked, and place it on the hoop or arch last played through. The form of marker preferred, although the same may be varied, consists of a plate of elastic metal, or other suitable material, bent in the middle, but not so that the two parts may come close together; on the contrary, a space is left between the two surfaces somewhat less than the thickness of the hoops or arches, so that a marker when passed down on a hoop or arch will, by its elasticity, retain its position by slight pressure. The markers may be of different colours or be numbered, or have devices thereon in order to indicate the players to whom they belong, and they may also be made to indicate the direction in which the balls of the players have been played through the hoops or arches. Heretofore the mallets employed in playing the game of croquet have had cylindrical heads, or heads of a circular transverse section; and part of this invention consists in forming the under surface of the head of a croquet mallet of a curved convex shape, with upright or nearly upright sides and ends, the sides being made somewhat hollow or concave from end to end. The two ends of the head of a mallet are of different dimensions; the larger end is of a rectangular form, somewhat wider than it is high, and the other or smaller end is also of a rectangular form, but of considerable width as compared to its height, the object being that this end of the mallet should be used by a player when striking his ball at the time his foot is placed thereon, which he is enabled to do with more certainty and advantage than when using a mallet with a head having a cylindrical form, or otherwise of a circular transverse section. *Patent completed.*

PROVISIONAL PROTECTIONS.

Dated July 15, 1862.

2035. T. G. Ghislin, Hatton-garden, importer. Improvements in the treatment or preparation of British and foreign algæ, and the application of the same to various branches of the arts and manufactures.

Dated July 22, 1862.

2080. A. Fournier, upholsterer, 18, Maddox-street. Improvements in the manufacture of easy chairs, seats for railway and other carriages, and other kinds of seats and mattresses.

Dated July 30, 1862.

2167. W. Norman, Manchester, cabinet maker. Improvements in tables and drawers or other sliding receptacles.

Dated August 1, 1862.

2186. W. E. Newton, 66, Chancery-lane, civil engineer. Improvements in projectiles for ordnance and small arms, and in the wads or sabôts to be used therewith. (A communication.)

Dated August 8, 1862.

2220. J. Sirou, Castelsarrazin, Tarn et Garonne, France, contractor of public works. A new medicinal preparation for internal and external application.

Dated August 16, 1862.

2311. S. A. Bell, Epping-villas, Stratford, lucifer-match manufacturer, and T. Higgins, Carriaco-terrace, Bow, tornographer. Improved apparatus for dipping lucifer matches.

Dated September 6, 1862.

2467. W. A. Richards, Chester-cottage, Cornwall-place, Holloway, commercial clerk. An improved fastening for purses, pocket books, bags, cigar cases, books, wearing apparel, jewellery, and other articles.

Dated September 16, 1862.

2542. W. Clark, 53, Chancery-lane, engineer. Improvements in the treatment of peat and peat tar for the production or manufacture of various products, and in apparatus for the same. (A communication.)

Dated September 19, 1862.

2571. J. B. Giertz, Great St. Helen's, City. Improvements in gas burners or jets.

2574. J. Imray, Bridge-road, Lambeth, engineer. Improvements in apparatus for telegraphing and signalling by means of electricity. (A communication.)

Dated September 23, 1862.

2591. J. Mapple, Newman's-place, Kentish Town, and D. Mapple, 3, Queen's-road, Homerton New Town, telegraph and clock makers. Improvements in telegraphic apparatus.

Dated September 27, 1862.

2634. M. Henry, 84, Fleet-street. Certain new and improved applications of petroleum and its products, certain agents produced by combining the same with other substances, and certain modes of treating caoutchouc, gutta-percha, and their compounds, and substances similar thereto. (A communication.)

Dated September 30, 1862.

2654. A. Prince, 4, Trafalgar-square, Charing-cross. Improvements in the manufacture of varnish, printing ink, paint, and printing colours. (A communication.)

Dated October 1, 1862.

2660. E. Lord, Rawtenstall, Lancaster, overlooker. An improvement in power looms for weaving.

Dated October 2, 1862.

2663. W. H. Ward, New York, and 59, Packington-street, London, N. Improvements in night, day, and fog signals, and the means for effecting the same.

Dated October 3, 1862.

2672. W. Clark, 53, Chancery-lane, engineer. Improved atmopsheric toy pistols and guns. (A communication.)

Dated October 4, 1862.

2684. J. M. Cabirol, 17, Rue du Faubourg, Montmatre, Paris, submarine engineer. A new or improved submarine lamp.

2688. W. Clark, 53, Chancery-lane, engineer. Improvements in the means of preserving goods from fire, and in apparatus for the same. (A communication.)

Dated October 6, 1862.

2693. T. Keech, New York. Improvements in floating batteries. (A communication.)

Dated October 7, 1862.

2711. J. K. Hampshire, Whittington, Derby, civil engineer. Improvements in apparatus or machinery for washing coal, coal slack, and other mineral substances, and separating foreign particles therefrom.

2712. J. Beale, Hope-street, Maidstone, gentleman, and M. A. Beale, Upper Brunswick-terrace, Barnsbury. Improvements in the preparation or manufacture of manure.

Dated October 8, 1861.

2714. C. F. Terry, Sheffield, accountant. Improvements in machinery for propelling vessels.

2715. D. Nickols, Manchester, engineer and manufacturer. Improvements in machinery or apparatus for measuring and registering lace and other similar articles.

2716. W. C. Burden, Leicester, musical instrument maker. Improvements in mechanism for giving the pitch or tone required in tuning musical instruments, and also the key note of vocal music.

2717. T. Ratcliffe, Colne, Lancaster, manager. Certain improvements in looms for weaving.

2718. P. Clavel, Paris, France, chemist. Improvements in the treatment of violet colours derived from coal tar oils.

2719. J. R. Harris, Goldington-crescent, St. Pancras-road, Middlesex, house decorator. Improvements in propelling vessels.

Dated October 9, 1862.

2721. H. Dullens, 13, Little Britain. An improved runner or fastening for umbrellas, parasols, sun shades, and other like articles.

2722. J. Maurice, 3, Langham-place, Regent-street, dentist. Improvements in steering ships or vessels, and in the apparatus to be employed for that purpose.

2723. W. Bush, Tower-hill, civil engineer. Improvements in cannon and small arms.

2724. C. N. Wilson, Batley Carr, near Dewsbury, rag-merchant. Improvements in rag machines.

2726. J. H. Johnson, 47, Lincoln's-inn-fields, gentleman. Improvements in the manufacture of paints or pigments. (A communication.)

2727. R. Hammond, 4, Trafalgar-square. Improvements in armour for ships of war.

2728. A. V. Newton, 66, Chancery-lane, mechanical draughtsman. Improved machinery for breaking and cleaning flax, hemp, and other like fibrous substances. (A communication.)

2729. J. B. Palser, Crown Hotel, Holborn, paper maker. Improved apparatus for manufacturing paper pulp and recovering the alkali used in such manufacture.

2730. G. Simons, 27, Place du Théatre, Liege, Belgium, manufacturer. Improvements in the manufacture of plates, rods, axles, tyres, and other articles that are required to be partly of iron and partly of steel.

Dated October 10, 1862.

2731. L. Hosch, commercial agent, 9, Laurence Pountney-hill, Cannon-street. An improvement in the mode of constructing travelling trunks and portmanteaus.

2732. W. and S. Scholefield, Ashton-under-Lyne, Lancaster, manufacturing jewellers. Improvements in apparatus for cutting button holes and other similar purposes.

2733. R. E. Green, Accrington, Turkey red dyer, and J. Cockcroft, machine printer. An improved amalgamation of materials forming a substance suitable for printers' blankets, conductors used in paper making, packings for joints, and similar purposes.

2734. G. Baguley, Hanley, Stafford, china manufacturer, and H. Greener, Sunderland, flint glass manufacturer. An improved construction of insulator for telegraph wires.

2735. J. Lowe, Claremont-place, Old Kent-road, machinist, and J. Harris, Ess Hill House, Newton Abbot, gentleman. An improved construction of propeller.

2736. H. A. Marinoni, Rue de Vaugirard, Paris, engineer. Improvements in apparatus for fixing type in the chases.

2737. W. C. Edge, Clerkenwell. Improvements in velocipedes.

2738. D. S. Sutherland, Crosby-square, City, civil engineer. Improvements in constructing beams, girders, bridges, and viaducts.

2739. W. Weallens, Newcastle-upon-Tyne, engineer. Improvements in surface condensers for marine and other engines.

2740. T. Anderson, Glasgow, mechanic. Improvements in the construction of ships or vessels.

Dated October 11, 1862.

2741. J. J. Shedlock, 63, Cambridge-street, Pimlico. Improvements in gas meters.

2742. E. J. Franklin, Birmingham, manufacturer. A combined spring tape measure, needle case, and pin cushion.

2743. A. Vennedy, Swan-yard, Shoreditch, manufacturer. An improved composition for covering and forming the tips of umbrellas and parasols, also applicable to covering the ribs and stretchers of same.

2744. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in breech-loading firearms. (A communication).

2745. W. Catchpool, 355, Goswell-road, miller. Improvements in fire escapes.

2746. J. Durant, 3, Stangate-street, Westminster, mechanical engineer. Improvements in the form and construction of chimney tops, or appliances for surmounting chimneys.

2747. T. Bouch, Edinburgh, civil engineer. Improvements in machinery or apparatus for charging or filling cartridges.

2748. A. V. Newton, 66, Chancery-lane, mechanical draughtsman. Improvements in evaporating apparatus applicable for the manufacture of sugar. (A communication.)

2749. A. V. Newton, 66, Chancery-lane, mechanical draughtsman. Improvements in sewing machines. (A communication.)

Dated October 13, 1862.

2750. S. Chatwood, Liver Safe Works, Bolton, safe manufacturer. Improvements in and connected with fire and thief proof depositories, and locks or fasteners connected therewith, parts of which improvements are also applicable to other purposes of security.

2751. G. and A. Harvey, Glasgow, engineers. Improvements in boring machinery.

2753. G. Haseltine, Fleet-street, American barrister-at-law. Improvements in "jacks" and screw nuts for attaching thills and poles of waggons and other vehicles to the axle trees of the same. (A communication.)

2754. C. McCarthy, New York. Improvements in automatic safety valves.

2755. W. Loeder, 1, New Broad-street, merchant. An improved projectile to be used with ordnance or firearms of any calibre. (A communication.)

2756. C. Thomas, Bristol, soap manufacturer. Improvements in the manufacture of silicate of soda or silicitate of potash, and in the manufacture of artificial stone.

2758. J. Gumbley, Llantrissent, Glamorgan, contractor. An improved break for vehicles travelling on common roads.

2759. A. I. Mahon, 25, Leinster-square, Rathmines, Dublin, engineer. Improvements in propellers and paddle floats, also applicable to the raising and forcing of water or other fluids.

Dated October 14, 1862.

2761. S. Smith, 204, High Holborn, engineer. Improvements in kettles, saucepans, and boilers for domestic and other purposes.

2762. F. G. Grice, West Bromwich, Stafford, manufacturer. An improvement or improvements in the manufacture of nuts for screwed bolts, and in machinery to be employed in the said manufacture.

2763. E. Suckow, and E. Habel, Manchester, machinists. Certain improvements in machinery or apparatus for preparing, spinning, and doubling cotton and other fibrous materials.

2764. H. Bridson, Bolton-le-Moors, bleacher and finisher, and J. Alcock, millwright. Improvements in machinery for folding, measuring, and hooking woven fabrics.

2765. E. Barlow, Bolton-le-Moors, machine maker, and J. Clough and F. Hamilton, foremen. Certain improvements in machinery for driving cotton gins, and for preparing and combing cotton and other fibrous substances.

2767. C. Harratt, Hornsey-lane, Highgate. Improvements in ships' masts.

2768. D. and C. J. Reid, Grey-street, Newcastle-upon-Tyne. Improvements in the manufacture of cases for watches and other pocket time-keepers.

2769. M. Cartwright, Hoxton, dentist. Improvements in plates for artificial teeth.

2770. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in apparatus for carburetting gas. (A communication.)

2771. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in dressing millstones, and in materials employed therein. (A communication.)

2772. E. H. C. Monckton, 5, Thurloe-place, South Kensington, esquire. Improvements in coils of induction, and in obtaining and applying power by means of electro-magnetism.

2773. O. J. and J. Showell, Manchester, surveyors. Improvements in the construction of glass roofs and roof lights.

2775. J. H. Johnson, 47, Lincoln's-inn-fields, gentleman. Improvements in sewing machines. (A communication.)

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

1768. T. Williams, and H. Cox. Churns.

1785. S. H. Huntly. Construction of furnaces.

1789. A. W. Makinson. Locomotive and stationary engines.

1792. M. Turner, and E. T. Loseby. Small arms and ordnance.

1808. R. Stansfield, and J. Dodgeon. Looms.

1816. J. B. T. Detuncq. Treating flax or hemp.

1822. J. W. Taylor. Regulating and indicating the flow and pressure of fluids.

1825. A. Warner. Manufacture of pigments or paints from certain refuse materials.

1826. G. Gray, and D. Cuningham. Casting or moulding metals.

1831. G. Simpson. Working, boring, and mining or excavating tools, and mine and other pumps.

1836. A. F. Maigron. Manufacture of tow or oakum.

1837. J. H. Redstone. Construction of boilers. (A communication).

1852. T. Desgrandschamps. Steam engines.

1859. M. A. F. Mennons. Steam boiler furnaces. (A communication).

1871. W. Clark. Frame for holding photographic pictures. (A communication).

1889. A. H. Martin. Apparatus employed in weaving.

1896. J. Garnier. Ordnance.

1901. J. Tatham. Preparing, spinning, doubling, and winding fibrous materials.

1917. R. A. Brooman. Construction of blast furnaces. (A communication).

2058. A. B. Brown. Steam engines and boilers.

2167. W. Norman. Tables and drawers or other sliding receptacles.

2184. J. E. Marsh. Metal rivets.

2186. W. E. Newton. Projectiles for ordnance and small arms. (A communication).

2311. S. A. Bell, and T. Higgins. Dipping lucifer matches.

2468. C. W. Williams. Steam boilers.

2569. J. Bouvet. Closing or sealing tin preserve boxes.

2628. J. Milner, R. D. Milner, and F. Hurd. Preparing wool, flax, and other fibrous substances.

2659. B. Donkin. Bearings for shafts, axles, pivots, and sliding surfaces. (A communication.)

2663. W. H. Ward. Night, day, and fog signals.

2667. G. J. Firmin. Treatment of certain salts of potash and lime.

2677. T. Greenwood. Machinery for cutting staves.

2693. T. Keech. Floating batteries. (A communication.)

2708. A. Forbes. Connecting together parts of vessels formed of tin plate.

2709. J. D. Welch, and A. P. Welch. Blocking and pressing hats and bonnets.

2717. T. Ratcliff. Looms.

2736. H. A. Marinoni. Fixing type in the chases.

2754. C. McCarthy. Automatic safety-valves.

2767. C. Harratt. Ships' masts.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed October 24, 1862.

1210. R. C. Mansell.
1211. P. R. Drummond.
1214. J. Elder.
1216. J. Aspinall.
1220. W. Hale.
1221. W. Fisken.
1222. L. McLachlan.
1226. T. U. Brocklehurst.
1234. H. W. Hart.
1237. A. Lester.
1243. R. Vaile.
1246. H. F. Wells.
1250. S. W. Newington.
1251. E. Clark.
1252. W. Clark.
1253. J. Ross.
1256. W. L. Tizard.
1257. D. M. Childs.
1258. D. M. Childs.
1259. D. M. Childs.
1260. E. B. Wilson.
1264. E. Moore.
1265. A. Travis and B. Travis.
1269. G. Davies.
1271. J. Maiden.
1277. J. M. Carter.
1278. A. Prince.
1279. W. Staufen.
1280. J. L. Norton.
1281. J. M. Napier.
1284. H. Willis.
1286. W. T. Loy.
1293. W. Bodden and W. Mercer.
1318. J. Fowler.
1322. C. Schlickeysen.
1328. H. Allman.
1339. E. B. Wilson.
1354. W. Clark.
1362. T. H. Hopwood.
1376. W. Riddle.
1431. T. Buckney.
1519. M. A. F. Mennons.
1894. M. A. F. Mennons.
1971. J. M. Gille.
2006. M. A. F. Mennons.
2105. T. Lemaistre.

PATENTS ON WHICH THE STAMP DUTY OF £100. HAS BEEN PAID.

2359. A. Parkes.
2466. W. Gardner.
2377. J. Rives.
2392. T. B. Sharp, and R. Furnival.
2404. J. Hands.
2399. S. O'Regan.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2410. G. T. Bousfield.
2416. W. Fox, and J. Willis.
2417. R. A. Brooman.
2594. T. D. Perkin.
2460. H. Phillips, and J. Bannehr.
2413. J. Avery.
2450. J. Armour.
2474. C. Stannet.
2477. J. A. Turner.
2458. P. R. Hodge.
2461. R. A. Brooman.

LIST OF SPECIFICATIONS PUBLISHED

For the Week ending October 18, 1862.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s. d.		s. d.		s. d.		s. d.		s. d.		s. d.
711	0 10	721	0 8	731	0 10	741	0 4	752	2 2	761	0 4
712	1 0	722	0 4	732	1 4	742	0 4	753	0 4	762	0 4
713	0 4	723	0 8	733	0 4	743	1 8	754	0 4	763	0 10
714	0 4	724	0 8	734	0 10	744	0 10	755	0 6	764	0 4
715	0 10	725	0 4	735	0 4	745	0 8	756	0 4	765	1 4
716	0 8	726	0 8	736	0 10	746	0 8	757	0 4	766	0 10
717	0 10	727	0 8	737	1 10	747	0 4	758	2 4	767	0 4
718	0 10	728	0 10	738	1 6	748	0 6	759	0 6	768	0 4
719	1 6	729	0 4	739	0 8	749	1 2	760	0 4	769	0 10
720	0 4	730	0 8	740	0 4	750	0 4				

Note.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Dates of Registration.	Nos. in Register.	Names and Addresses.	Subjects of Design.
Aug. 14,	4502	T. Wilson, Birmingham	Spanner.
" 20,	4503	J. Rider, Bedminster...	Tap.
" "	4504	W. C. Edge, St. John's-street-road............	Fastener.
" 25,	4505	H. Willmot, Birmingham.	Expanding frame
" 28,	4506	T. W. Gore, Old Whittington	Improved joint.
" 30,	4507	J. Barwell, Birmingham......................	Tap.
Sept. 6,	4508	G. T. Wallis and G. H. Smith, Westminster.	Stamp damper.
" 8,	4509	G. Burt, Birmingham.	Dark lantern
" 19,	4510	G. and J. Russum, Leeds	Bristle holder.
" "	4511	H. Coulter, Liverpool..	Neck clamp.
" 24,	4512	S. Needham, Chelsea...	Match holder.
Oct. 1,	4513	R. Sill, jun., Birmingham.	Label card.
" 3,	4514	R. and G. Phelps, Birmingham..............	Locket.
" 15,	4515	A. C. Bamlett, Middleton Tyas.	Wheel.
" 18,	4516	G. F. Busbridge, East Malling................	Writing case.
" 25,	4517	Birtles and Gottwaltz, Birmingham.	Singeing lamp.
" 27,	4518	J. Shrimpton and Son, Studley	Crochet needle

PROVISIONAL REGISTRATIONS.

Aug. 16,	1370	C. Pullinger, Selsy......	Trap.
" 19,	1371	J. T. Hewes, Brompton	Ladder
" 21,	1372	A. W. Banks, Newgate-street.........................	Leglet.
" 22,	1373	T. Smith, Bishop's Waltham...............	Land battery.
" 25,	1374	P. I. Cobbaert, Dorset-place, Dorset-square.	Skirt.
" 30,	1375	E. Barker, Great Castle-street, Regent-street.	Brush stand.
Sept. 3,	1376	T. Fisher, City-road.....	Tobacco pipe.
" 12,	1377	S. Lee, Langton-terrace East	Instrument for computing the area of fluids and other surfaces.
" 18,	1378	J. Hunt, jun., Cullum-street, E.C.	Strap.
" "	1379	J. House, London-fields	Protractor.
" 26,	1380	S. Blake and Co., Sheffield.	Rhomboidal body for metal printing types of an italic or other sloping character.
" "	1381	M. Boyle, New Ormond-street......................	Trunk.
Oct. 2,	1382	M. Boyle, New Ormond-street..........................	Writing case.
" 13,	1383	W. W. Wynne, Whitechapel.	Furnace bar.
" "	1384	T. Dallow, Wolverhampton.	Lamp shade.
" 20,	1385	C. S. Windover, Huntingdon.................	Phaeton.
" 25,	1386	J. Campbell, Grove, Holloway................	Watch bow.

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, NOVEMBER 7, 1862.

LIVES OF THE ENGINEERS.*

Bid harbours open, public ways extend;
Bid temples, worthier of God, ascend;
Bid the broad arch the dang'rous flood contain,
The mole projected, break the roaring main;
Back to his bounds their subject sea command,
And roll obedient rivers through the land.
These honours Peace to happy Britain brings;
These are imperial works, and worthy kings.
POPE.

WHEN, some twelve months since, it fell to our lot to review the two first volumes of the "Lives of the Engineers," we took the opportunity of advising Mr. Smiles to lose no time in continuing the great work upon which he had, with so much success, entered. That advice, we are pleased to find, has been acted upon, and the result is a third volume, which now lies before us. No doubt the task of producing this was comparatively an easy one, because the author had already, in his well-known memoirs of George Stephenson, travelled over the ground which is again explored in the work under notice. In his preface to the third volume of the "Lives of the Engineers," which is exclusively devoted to the illustrious father and son, George and Robert Stephenson, Mr. Smiles tells us very truly that, "although it is "unusual to embody two biographies in one "narrative, yet that in the case of the Ste- "phensons such a combination is peculiarly "appropriate, the life and achievements of the "son having been in a great measure the com- "plement of the life and achievements of the "father. The care with which the elder "Stephenson, while occupying the position of "an obscure workman, devoted himself to his "son's education, and the zeal with which the "latter repaid the affectionate self-denial of "his father, are among the most effective il- "lustrations of the personal character of both." Indeed, it would have been unwise to have adopted any other course than the one which Mr. Smiles thus sketched out for himself, and we shall now endeavour to ascertain, and to record the amount of success which has attended our author in dealing with the two subjects of his third volume. In the first chapter of the work an historical account of Newcastle-upon-Tyne, usually called the birthplace of George Stephenson, from the period of the Roman occupation of Britain down to the middle of the last century, is given, as well as a description of the physical peculiarities of the neighbouring country at the latter period. The following graphic picture of the Newcastle of to-day will be recognized by those who have visited it:—"Newcastle is, in many respects, a town of "singular and curious interest, especially in its "older parts, which are full of crooked lanes "and narrow streets, wynds, and 'chares,' "formed by tall, antique houses, rising tier "above tier along the steep northern bank of "the Tyne, as the similarly precipitous streets "of Gateshead crown the opposite shore. A "dense cloud of smoke continually hangs over "the place, almost obscuring the sun's light. "North and south the atmosphere is similarly "murky, and all over the coal region, which "extends from the Coquet to the Tees, about "fifty miles, the surface of the soil exhibits "the signs of extensive underground workings. "In every direction are to be seen swollen heaps "of ashes and refuse, coals and slag, the "rubbish of old abandoned pits, and the pump- "ing engines and machinery of new. As you "pass through the country at night, the earth "looks as if it were bursting with fire at many "points; the blaze of coke ovens, iron furnaces, "and coal heaps, reddening the sky to such a "distance that the horizon seems to be a glow- "ing belt of fire." The necessity which, at a very early period, existed for facilitating the transport of coals from the pits to the shipping stations, naturally excited the inventive faculties of those who were employed in the work. In the first instance, the most laborious of all modes of conveyance was adopted, that of carrying the coals in panniers on the backs of men to the boats. This yielded to the employment of sacks on horses' backs for the same purpose. Then carts and tramways of flat stones were used. A local writer, of about the middle of the seventeenth century, says: "Many thousand people are engaged in this "trade of coals. Many live by working of "them in the pits, and many live by conveying "them in waggons and wains to the river "Tyne." Other means of transport are referred to by Mr. Smiles, and among them, wooden trucks of peculiar construction, and which may be considered the germ of the modern railroad. The first iron rails are supposed to have been laid down in 1738. This cast-iron road was denominated a "plate-way," from the plate-like form in which the rails were cast.

It is shown by the books of the Coalbrookdale Iron Works, in Shropshire, that five or six tons weight of rails were cast at that place, as an experiment, on the suggestion of Mr. Reynolds, one of the partners, and they were shortly after laid down to form a road. With a commendable amount of research and inquiry, Mr. Smiles has endeavoured to trace the rise and progress of the railway prior to the time when George Stephenson perfected, so to speak, its development, and has preserved from oblivion the names of some of the predecessors of the great engineer. Some of the anecdotes in relation to these modest pioneers, who may be literally said to have "paved the way" for the introduction of modern railroads, are at once interesting and instructive. We learn, for example, that "in 1776, a cast-iron tram- "way was laid down at the Duke of Norfolk's "Colliery, near Sheffield. The person who "designed and constructed this coal line was "Mr. John Curr, whose son has erroneously "claimed for him the invention of the cast- "iron railway. He certainly, however, "adopted it early, and thereby met the fate "of men before their age. His plan was "opposed by the labouring people of the "colliery, who got up a riot in which they tore "up the road and burnt the coal-staith, whilst "Mr. Curr fled into a neighbouring wood for "concealment, and lay there *perdu* for three "days and nights, to escape the fury of the "populace." The plates or rails of this line were, according to an illustration, cast with flanges on their inner edges to guide the wheels along it. By these gradual steps was progress made in the formation of railways, and there is no doubt that the locomotive was the result of similarly gradual improvements. "The "locomotive is not the invention of one man," said Robert Stephenson, once at Newcastle, "but of a nation of mechanical engineers."

The different contrivances for raising coals from the pits, the application subsequently of Newcomen's engine to that purpose, and some interesting glimpses of pit life, bring us to the end of what may be termed the introduction to the third volume of the "Lives of the Engineers," and to the birth time of the elder Stephenson. At the colliery village of Wylam, about eight miles west of Newcastle-upon-Tyne, there lived, in 1781, and in a house still standing, Robert Stephenson, or "Old Bob," as his neighbours called him, and his wife Mabel. They were a respectable couple, careful and hard-working; they belonged, indeed, as Mr. Smiles justly remarks, "to the ancient "and honourable family of workers—that ex- "tensive family which constitutes the back- "bone of our country's greatness, the "common working people of England." Such were the parents of George Stephenson. On the 9th of June, 1781, the latter came into existence, and the apartment in which he was born is now what it was then, "an ordinary "labourer's dwelling; its walls are un- "plastered, its floor is of clay, and the bare "rafters are exposed overhead." Robert Stephenson, the father of George, and of five other children, whose births were duly recorded on the fly leaf of the family Bible, though not on the parish books, was a tall gaunt man. A Wylam collier gave the following odd description of him and his wife:—"Geordie's "fayther war like a peer o' deals nailed the- "gither, an' a bit o' flesh i' th' inside; he war "queer as Dick's hatband—went thrice aboot, "an' wudn't tie. His wife Mabel war a "delicat' boddie, an' varry flighty. They war "an honest family, but sair hadden doon i' th' "world." Into other peculiarities related as pertaining to "Old Bob," it is not desirable here to enter, but the following glimpse of the early days of George Stephenson is worth transcribing:—"The boy led the ordinary life of "working men's children. He played about "the doors; went birds'-nesting when he "could; and ran errands to the village ". . . At home he helped to nurse—and "that with a careful hand—his younger bro- "thers and sisters. One of his duties, too, was to "see that the other children were kept out of "the way of the chaldron waggons, which "were then dragged by horses along the "wooden tramroad, in front of the cottage "door. This waggon-way was the first in the "Northern district, along which the experi- "ment of a locomotive engine was tried. But "at the time of which we speak, the locomo- "tive had scarcely been dreamt of in England "as a practical working power." Eight years of the future engineer's life was spent in this way, and then his father, having obtained employment as a foreman, at Dewley Burn Colliery, removed with his family to that place. The natural shrewdness of "Geordie" frequently showed itself conspicuously at this early period of his life, and some amusing instances of the fact are recorded by Mr. Smiles. But it was necessary that the boy's talent, and strength, such as it was, should be devoted to the purpose of assisting in the maintenance of the household, or at least, in supporting himself. His first actual employment was to herd the cows of a widow, occupying a farm-house in the neighbourhood, and to keep them off the track of the coal waggons. Two-pence per day was the munificent return for this humble service. Such spare time as could be got was devoted, with his chosen companion, "Bill Thirlwall," to the erection of clay engines and Lilliputian mills. They even proceeded to make a miniature winding machine, and the apparatus was erected upon a bench in front of Thirlwall's cottage. These amusements are worthy of note, because they betoken the bent of that mind, which was afterwards to conceive projects of so much importance to the community. Thirlwall, it may be said, in passing, afterwards became a workman of repute, and filled the office of engineer at Shilbottle, near Alnwick, for a space of twenty or thirty years.

* Lives of the Engineers, with an Account of their Principal Works; comprising also a History of Inland Communication in Britain. By Samuel Smiles. With numerous Portraits and Illustrations. Vol. III. George and Robert Stephenson. London: John Murray, Albemarle-street. 1862.

Subsequently, George Stephenson worked in the fields, leading the horses at the plough, hoeing turnips, and making himself "generally "useful," at the advanced wages of 4d. per day! His ambition, however, was not satisfied. He desired to be employed at the colliery where his father worked, and this wish was soon gratified. At Dewley Burn he was first set to work as a "corfbitter" or "picker," his duty being to clear the coal of stones, bats, and dross. Sixpence per day was now paid him, and at length his promotion to the driving of the "gin-horse" led to the increased allowance of eightpence per day. Black Callerton Colliery was the scene of his next operations, and in this he also drove the gin. One of the old residents of Black Callerton, who well remembered "Geordie," described him to Mr. Smiles at the period named as a "grit growing "lad with bare legs an' feet," adding that he was "very quick-witted and full of fun and "tricks." At fourteen years of age, Stephenson was appointed assistant fireman at Dewley Burn Colliery, and his pay at this time was one shilling per diem. The working out of the pit at last brought this engagement to a close, and "Old Bob" and his family were compelled to change their quarters.

At Jolly's Close, near the village of Newburn, the Stephensons took up their next abode, and this was humble enough, for they occupied "a cottage of one room," and "in which the father, mother, four sons, and two daughters lived and slept." Colliery occupations of one kind and another were followed at this place by the various members of the family, until George was sent, with a comrade, named Coe, to work a pumping engine near Throckley Bridge. While employed at this place, Stephenson's wages were raised to twelve shillings per week, an event which elated him much. "On coming out of the foreman's office, on the Saturday evening on which he had received the advance, he announced the fact to his fellow-workmen, adding, triumphantly, 'I am now a made man for life!'" It was not, fortunately for the world, the disposition of George Stephenson to remain content at any one point of his career. "Excelsior" was his motto, and he knew that apathy was not the means for effecting advancement and self-elevation. Appointed as "plug-man" at a new pit some short distance from Newburn, he took an opportunity of studying the working of the steam engine there. This engine, indeed, "became a pet with him, and he never wearied of watching and inspecting its movements."

One great drawback, Stephenson began now to find was, his lack of education. Although eighteen years of age, he was unable to read. Having once become conscious of the disadvantages under which his ignorance of "bookish theory" placed him, he was not long in setting about removing them. "His "first schoolmaster was Robin Cowens, a "poor teacher in the village of Walbottle. . . ." Robin's teaching cost threepence a week, and by its aid, Stephenson soon learnt to read. He also practiced "pothooks," and at the age of nineteen, was proud to write his own name. In 1799, Andrew Robertson, a Scotch dominie, set up a night school at Newburn, and during the winter of that year one of his most persevering pupils in the "figuring" department, was George Stephenson. The post of brakesman was next given to the future engineer, and it was while engaged in this occupation that he devoted his spare time to shoe-mending, and afterwards to shoe-making. These pursuits were probably followed with more avidity from the fact that he had now formed an attachment for a young woman, named Fanny Henderson, a servant in the farm-house, in which he lodged, and desired to save money wherewith to marry and establish a home for himself. An amusing story is told of his soleing the shoes of his sweetheart, and making a "capital job" of them. Out of his earnings by shoe-mending, Stephenson contrived to save "his first guinea," and of this feat he was justly proud.

A quarrel with a pitman—a "roistering "bully, who was the terror of the village of "Black Callerton," led Stephenson to engage in a pugilistic encounter, and great was the excitement, when it was known that this event was to take place. His antagonist, Ned Nelson by name, was no novice at fighting, and hence it was supposed that Geordie would be severely punished in the coming encounter. "On the evening of the day appointed," says Mr. Smiles, "after "George had done his day's labour, he went "into the Dolly Pit-field, where his already "exulting rival was ready to meet him. "George stripped and 'went in' like a prac-"tical pugilist, though it was his first and last "fight. After a few rounds, George's wiry "muscles and practised strength enabled him "severely to punish his adversary, and to "secure an easy victory. This circumstance "is related in illustration of Stephenson's "pluck and courage, and it was characteristic "of the man." At twenty-one years of age an offer was made to George to take charge of the engine at Willington Ballast-Hill. This he accepted, and at the same time made "an "offer" himself to Fanny Henderson, and which she did not decline. On the 28th of November, 1802, the wedding took place at Newburn church, and a cottage dwelling received the newly-married pair.

While at Willington Mr. William Fairbairn, of Manchester, made the acquaintance of Stephenson, and the friendship thus begun lasted for many years afterwards. At Willington, too, Stephenson's only son Robert was born on the 16th of October, 1803, and the child was from the first a great favourite with his father, whose evening hours were made happier by his presence. After working about three years as a brakesman at the Willington machine, George Stephenson was induced to take a similar post which presented itself at the West Moor Colliery at Killingworth. "The village of Killingworth is about "seven miles north of Newcastle, and is one of "the best known collieries in the district." Thither went our "hero,"—such he may be truly called, for none have ever more vigourously and manfully carried themselves in the battle of life than he—in the year 1804. Scarcely had he reached his new abode, however, when the shadow of death fell across his threshold—his wife died. "It was a terrible blow to him, and he "long felt the bereavement." Other changes were—perhaps fortunately, for they diverted his mind from domestic sorrows—in store for Stephenson. He received an invitation to proceed to Montrose, in Scotland, and to superintend the working of one of Boulton and Watts' engines. "Having left his boy in the care of "his father and mother, he set out upon his "long journey to Scotland on foot, and with "his kit upon his back."

At Montrose his mechanical abilities developed themselves, and his management of certain repairs of the pumping machinery brought him much credit. At the end of twelve months he returned to Killingworth, with a clear saving of £28 in his pocket. On his way home, on foot, Stephenson was hospitably entertained by an honest couple, who would not hear of any recompense for their good offices. Later in life, when the sun of fortune shone brightly upon the 'erstwhile foot-sore, and weary traveller, he sought their cottage again, and when he left it they may have been reminded of the old saying, that we may "sometimes entertain angels unawares."

We shall return to this subject in our next number.

JURY REPORTS—CLASS VIII.

As our readers will have seen, we printed in our three preceding numbers one of the "Reports of the Juries," International Exhibition, this particular one being in Class VIII., machinery in general. The whole of these Jury reports were promised to the public for August last; some disjointed, meagre little pamphlets made their appearance about the beginning of October. So much for the punctuality of the performance. We feel it to be our duty, however, as we have copied this particular report, to make a few observations about its contents to our readers.

In No. 3 of "General Explanations and Remarks," the Jury say, that if they had not been prevented by clause 5 of the decisions of the Commissioners, they (the Jury) would have awarded medals to—1801, N. and L. R. Bodmer, safety valves for steam boilers; 1955, J. Penn and Sons, marine engines, and parts of marine engines. We should like to know in what respect these two members of the Jury are behind hand in recompense to those exhibitors that have been dignified with an, as yet, unfulfilled promise of a medal? These two jurors are much better off than an exhibitor; say, from California; for while they get all the honour (?) of a public mention, they have not to pay any freight for an ugly piece of pewter, with an inartistic design. We do not suppose that the unlucky guarantors will send the medals out free.

Nos. 5 and 8 of these "general explanations "and remarks" form a mere tirade of excuses for shortcomings; as the French very truly say, "Qui s'excuse, s'accuse."

No. 11. is a complete repetition in almost the very same words, of a part of the speech of Mr. Fairbairn to the mechanical section of the British Association of Cambridge. In pages 3 and 4, the observations about the prevalence of the horizontal form of engine also appear in Mr. Fairbairn's speech. To say the least these are very remarkable and curious coincidences.

In Subdivision I., Section III., the marine engine of the Mediterranean Company (France) is mentioned as the exception to the general use of the link motion for reversing. It just happens that there is another marine engine in the Exhibition, a Swedish one, also reversing without a link.

Page 6, Section VI., some water-pressure engines are generously accredited to Messrs. Smith, Beacock, and Tannett, of Leeds. We believe that these gentlemen never made such an apparatus in the whole course of their career.

Section VII., "vacuum power-engine." We agree entirely with the Jury in the sapient remark they make under this title. They say, "that they could find no engines to which the "above description seemed to be applica-"ble."

In Subdivision IV., Section I., driving bands, and some engine governors, are appropriately (!) classed together; we presume, however, by a fault of the printer. Under this same section, a governor of Mr. Schiele is alluded to in terms that would lead one to conclude that a specimen is at work. There is, however, only a drawing. Mr. Bourdon, of

Paris, exhibits a governor upon exactly the same principle, worked by his own peculiar centrifugal pump. In the first case the semblance is noticed, while in the other the substance is passed over.

Subdivisions III. and IV. are distinguished by some rather peculiar phrases, enlivening the dreary list of machines, each allusion or attempt at description being grafted on to the others by a running commentary of "soft saw-"der." Such sentences as "to profit by this "property" (Subdivision III., Section III.) and "this pump has the general disposition of "a fine engine pump" (Subdivision V., Section I.) are, we dare say, excellent French. As English, they seem to us as being rather calculated to mislead anybody that has not cultivated the language of "the most polite nation in the "universe." "To profit by this pro-"perty," has a rather High Court of Chancery sound about it. "The general dispo-"sition of pumps," at least about London, is said to be a bad one. London pumps being somewhat "disposed" to weaken "lacteal "produce." We should like to know what is new in Messrs. Carrett, Marshall and Co.'s donkey pump, that those "constructors" are dignified by its long description.

In this part also it is mentioned that Appold and Gwynne's respective centrifugal pumps offer "no essential difference except in "the position of the axis of the wheel, which is "vertical in the first, and horizontal in the "second."

We, in our ignorance, always thought that there was an essential difference in the vanes. There also happen to be several small pumps of Mr. Appold's in the Exhibition with *horizontal* axes. In a description of F. O. Ward's hydraulic press pump, *four* pumps are distinctly given to the arrangement, when there are only two in the Exhibition. We have no doubt that a further investigation would show many more mistakes, but we have mentioned enough to show the way in which this report has been got up.

It looks as if some fatality, some malediction lasted in the executive of the Exhibition. Nothing that they do, or have done, directly or indirectly, seems to prosper. Unlike the fabled King of old, whose touch transmitted everything into precious metal, their hands turn everything into rottenness. Visitors and exhibitors, English and foreign, gurantors and employés, all alike, have successively turned away with disappointment. Any success that has been achieved, has been like the success of a soldier's victory, owing nothing to the generalship of the leaders. The history of the management is simply the history of a succession of blunders. The building is an abortion, badly lighted, ventilated, and arranged, setting at defiance all science and taste. Built according to an absurd contract, it is, from every point of view, scientifically, artistically, and commercially—a failure. The arrangement of the things exhibited, the official catalogues, the "Cadogan" commissariat, the distribution of the awards, the so-called reports, the different "positively the last times;" all these things have provoked smiles of derision from one end of Europe to the other.

IRON WALLS AND NAVAL GUNS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—I must not complain of being drawn into a controversy I have provoked. Having thrown down the gauntlet, I am bound to enter the lists and meet all comers who offer battle. Some of them are sturdy combatants, but I am prepared to encounter and repel their assaults like a knight "*Sans peur et sans reproche.*"

The first to break a lance with me is Mr. C. J. Richardson, a *preux chevalier*, who bears his device, "deflection," emblazoned on an enormous shield. He is bold and confident in attack; we shall see how he will fare. It is a pity to make so gallant and honest a partizan bite the dust, but I must strike home when fame and reputation are at stake.

I am "altogether wrong," Mr. Richardson boldly states, in calling the systems of Mr. Roberts and Mr. Westwood "angulated." If I were wrong, I should keep the word of which he reminds me, and admit my error—but I am not wrong. I have yet to learn that an angle is not an angle because it is *small*, for that is the sum and substance of my assailant's argument. In criticising my objection to "angular projections," he admits that I "justly remark they may be readily shot away," and in the same breath protests they are not angulated. It is hard to please everybody with names, but I must maintain "a spade is a spade." In my letter of the 24th October, I alluded slightly to Mr. Richardson's deflective shield, and I had no intention of exposing its defects, for I thought the questton was disposed of, and that even the inventor himself, whatever might be the merit of the plan in theory, was convinced it could not be realised in practice. But as he will have my opinion, I will give it. On the last day of the Exhibition, I took a good survey of the gigantic drawings of the "deflective shields" suspended on the walls of the Military Engineering Department. They would have been attractive in the picture gallery. After careful inspection, I discovered that, what with the apex of the main cone and the smaller cones or bosses, to protect weak points and bolt-heads, there are, within the area of one shield, 20 ft. in diameter, eight or nine of those protruding points which Mr. Richardson acknowledges I justly condemn. On a closer examinatiou I observed that the main support of the armour, the central bolt, is in the most critical position, inasmuch as its security depends upon the advanced angular projection, which covers it, remaining intact. Now, I hold that this culminating point would be shot clean away by the first heavy round or flat-headed shot which struck it. Thus a breach would be made in a vital part, and the next shot which hit within a foot of the fractured apex, would smash right through everything. The smaller lights would share the fate of the greater luminary—the little bosses would be more easily demolished than the big one.

In what I have said about deflection, after *quiet consideration*, I have not a word to retract. If it be a truth, it is only of value when developed by the smooth surface of a continuous curved or inclined plane. Now this is not the characteristic of Mr. Richardson's central and satellite protuberances, any more than it is of Mr. Roberts's or Mr. Westwood's projecting points. At whatever period of my first series of letters I first used the *word*, Mr. Richardson, if he searches, will find that I did in your journal frankly and fairly discuss the *subject* of deflection, on its real merits. I do not wish to shelve it. It is not in my nature to do so with any question. I will briefly reiterate a former statement. The Iron Plate Committee made a number of experiments at Shoeburyness, to test the principle of deflection on plates at angles, of, I believe, 45 deg. to 60 deg. to the horizon. These are deflecting planes far more favourable than that of Mr. Richardson's shield, which I take to be about 70 deg. or 20 deg. from the perpendicular. From the results of these experiments the committee came to the conclusion—a conclusion which was formally promulgated at a meeting of the Society of Civil Engineers—that taking the same vertical height perpendicular or inclined, the same weight of iron offered the same resistance. In other words, whatever is gained by deflection, in reducing the thickness of the plate, is lost in the increased length of the incline as compared with the perpendicular surface.

Mr. Richardson's illustration of a Highland shield is not happy. Its boss, its convex rim, and its broad expanse, were admirable to turn off the stroke of the broad sword and cover the person of the warrior; but that form of shield was a frail defence against the battle-axe or the ponderous mace, either of which, wielded by the strong arm of a powerful man at arms, fell like a projectile on one point and crushed through the weak places. He evidently has taken no account of the *angle* of deflection, which is the very soul of the principle. At an acute angle to the plane of the line of flight of a projectile, deflection is fully developed and penetration is frustrated. An angle of 45 deg. would seem to be the maximum inclination from a horizontal line for useful effect. If that theory be correct, a more obtuse angle of inclination would deflect so little that practically it would be no better than a perpendicular. Hence, apart from its defects of construction, the deflecting action of the Richardson shield on the side of a ship would be *nil*.

I think your readers, who are judge and jury in these friendly trials in your columns, if not the plaintiff himself, will admit my defence is good, and will find a verdict to the effect that, in all I have written about angulated projectiles and deflection, I have been, if not wiser than others, at least consistent; and in spite of Mr. Richardson's bantering, which I take in good part, I trust we part on friendly terms, for I have not time to carry this discussion any further.*

I must now do Mr. St. John Vincent the justice to say, that, having well-considered his deflective plan, of which diagrams appeared in the MECHANICS' MAGAZINE, it is, for the side of a ship, the most intelligent I know of. I did not at first embrace his conception of clothing the side of a vessel with one breadth of plate, extending from the required distance below the water-line to the gunwale. I have read his long letter, addressed to you, Sir, and examined his second plan, with much attention, but I do not think it would promote his interest, or be of any public use to give it publicity. The combinations of the plan are most ingenious, and exceedingly well-devised. They result in the formation of a girder of equal strength at all parts—precisely the principle I have constantly advocated — and covering each side of the ship, from stem to stern, with a coat of mail, which might be the hull of the ship itself. But these combinations resolve themselves into the *crucial* test, the *fastening*. The whole system depends upon screw-bolts, holding the outer plates, which Mr. Day calls the "joint pieces," into the backs of which the screw points are tapped. That gentleman probably is not aware that the experiments of the Iron-plate Committee seemed to justify the conclusion they arrived at, that this mode of fastening is inadmissible. At different target trials the points of screw-bolts tapped into plates snapped short off at the first thread, and, in one remarkable instance, every bolt was thus destroyed, and the plates fell bodily off the supporting iron frame. In some of my earlier let-

* We cannot afford any more space at present for this controversy on deflective armour.—ED. M. M.

ters these experiments are described, and the result is endeavoured to be accounted for by assuming that the screw-bolts, being incorporated with the plate, and at the same time holding it, they become the points of resistance, which receive the shock of impact, and hence are fractured by vibration.

Q in the corner—I beg the gentleman's pardon—"Q.X." thinks he has got me on the hip. But he has not. He is a technical and verbal critic, with whom one must mind his P's and Q's. So I will be as technical and verbal as he is. I will ask him to be kind enough to point out when and where I have stated that the power which propels a cannon ball, and the power which drives a punch, are identical in their nature. I never said so or thought anything of the kind. In establishing a parallel between gunpowder and a machine, I simply said they were respectively the driving power in each case. "Q.X." has pointed out a difference in the *action* of the two forces, which is a matter of fact, and I thank him for drawing my attention to that difference, because it strengthens the case I want to establish, believing it to be a great and important truth, namely, that a projectile fired against an armour-plate *"pari-passu" cannot do more work than a punch driven through a boiler plate.* I assumed that the action of the two forces was of the same nature. If, then, from the moment of impact, that is, of contact of the gun punch and the machine punch with the surface of the plate, the former is propelled by a *diminishing* force, and the latter by a *sustained* and *undiminished* force, it follows that the projectile will not do so much work as the boiler makers' punch. As Antonio said to Shylock, "I thank thee, "Q.X.," for that word." My friend —I hope he will allow me to call him so—is troubled because I say the resistance of wood against 100 or 150-pounders is of little or no use, and he kindly reminds me it offers *some* resistance. Again, I never said it did not; but I write and think for a practical purpose, and in expressing my ideas, I use the common conventional forms of language which all *educated* persons understand; and I really should think it a work of superrogation to be always reminding the scientific readers of the Mechanics' Magazine, that the density, weight, and resisting power of wood, as compared to those of iron, are only 1-9th or 1-10th. When a ship sails badly we say she makes *no* way; when a horse is a screw we say he has *no* go in him; and when a man is not over bright we say he has *no* brains, whilst every one understands that this form of negation simply means a comparatively infinitessimal small quantity. The Champion—to whom, in closing the lists for this bout, I have to give the *coup de grace*—as a triumphal clincher, asserts that wood not only does resist the shot, but would finally stop it altogether, "if there was enough of it." True, and so would tallow or butter, *if there was enough of it;* but surely that is not an argument in favour of one or the other, when circumstances render the use of *enough* of either as a backing to iron plates an impossibility and an absurdity.*

A plan of ship's armour, described in the *Engineer*, by J. H. Stacey, has been brought under my notice. It consists in placing narrow bars of iron either horizontally or vertically edgeways. I suppose Mr. Stacey does not read the Mechanics' Magazine, and therefore has not pored over the lucubrations of your humble servant. If he had done so he would have known that his idea is no novelty. It is carried out with the so-called Thorneycroft bars, but which really are the joint invention, under letters patent, of Mr. Lancaster, the well-known gun maker, and Mr. John Hughes, an engineer of practical experience in the manufacture and effective use of iron. These bars, 8 and 10 in. in width and 4 in. in thickness, placed horizontally, were applied to the construction of trial targets and experimented upon at Shoeburyness last year. The thickness in this case exceeds that proposed by Mr. Stacey, but the principle conceived and the objects are the same, namely, the resisting force of narrow bars, edgeways, and economy of price. The result of the trial, in respect of the resisting force of bar iron, was not unsatisfactory, but the mode of fastening and of tongueing and grooving the bars adopted by the inventors were fatal defects; and, as will be seen in the reports of the trials at the time, the targets were demolished. I agree with Mr. Stacey that the plan has merit, and deserves serious attention, but the fastening is the obstacle to be overcome, and it is not a small one. The plan shown in the drawing would, I think, not answer. The holes through the thin bars laterally would inevitably cause them to crack across the perforations, and the suggestion of bolt heads and nuts let into *adjoining* plates, or countersunk rivets, is so crude and vague, it is of little value, and cannot be relied upon, unless it be brought into a practical and workable shape. The thinner the bars the greater the difficulty of fastening them, because there is so small an area of metal to lay hold of. I do not, however, say a good fastening for bars may not be devised. I, long ago and often, have expressed a strong opinion in favour of bars or narrow plates for the armour of ships and forts, in preference to the ponderous and unwieldy masses of iron now in use. From these explanations Mr. Stacey will perceive his idea is not original.

CIVILIAN.

* Mr. Cheverton's letter on this question, which will be found in another column, was in type last week, and not inserted for want of space.—Ed. M. M.

ON THE WEAR AND TEAR OF AGRICULTURAL STEAM-ENGINES AND THRESHING MACHINES, WHETHER FIXED OR PORTABLE.*

By Henry Evershed.

In this paper an attempt is made to estimate the cost of repairs and other charges on agricultural steam-engines and threshing machinery. The costs in question vary largely, according to circumstances. We adhere strictly to actual returns and to cases that have come within our own knowledge, selecting specimens of various results—good, bad, or moderate—in the hope that the reader may be able to strike an average applicable to his own case, and to establish a reliable basis for calculations as to the cost of steam-power, whether used for threshing—which is more especially considered here—or for cultivation.

Repair of Portable Engines.

A 5-horse power portable steam-engine, belonging to the Right Hon. the Earl of Stradbroke, of Henham Hall, Suffolk, which was used to do the work of the home farm, including threshing and grinding corn, and cutting chaff for a large stud of horses, and for farm stock, cost for repairs as follows:—

		£	s.	d.	£	s.	d.
1852. April 17th.	Cost of 5-horse power engine, £180.						
1853. Sept. 29th.	Material	0	2	3			
Oct. 28th.	Fire-bars	1	13	4			
					1	15	7
1854. March.	Gauge-glass and grummets	0	4	9			
June 19th.	Ditto	0	6	6			
August.	Gun-metal bearing for crank shaft	3	10	0			
November.	Fire-bars	1	11	2			
"	Back	0	10	2			
					6	2	7
1855. February.	Water-gauge and glass, and grummets	0	5	9			
March.	Repairs	10	17	9			
"	Fire-bars	0	11	4			
					11	14	10
1856. September.	*An accident.*						
"	New smoke-funnel, brasses throughout, new crank, governors repaired	26	0	0			
"	A cast back	0	9	11			
"	Flue-brushes	0	6	0			
					26	15	11
1858. March.	Repairs and bars				10	15	0
	Total cost of repairs in six years				£57	3	11
	Average, £9 10s. 8d.						

* From the Journal of the Royal Agricultural Society.

But it must be further stated that in the following year the engine required a new fire-box and extensive repairs.

An 8-horse power portable steam-engine, belonging to Mr. E. Cottingham, Dunningworth Hall, Suffolk, gave this result:—

		£	s.	d.	£	s.	d.
1858. December.	Cost of 8-horse-power engine, £235						
1859. February.	Fire-bars	1	0	0			
Nov. 12th.	Flue-brushes	0	6	0			
"	Water-gauge glasses	0	14	0			
December.	Adjusting brasses	0	19	6			
					2	19	11
1860. February.	Gauge glasses	0	12	6			
April.	Repairs, &c.	2	10	2			
"	Do. exhaust-pipe	1	11	6			
Oct. 6.	Funnel-joint	0	6	0			
					5	0	9
1861. Jan. 1.	Repairs	6	13	6			
Mar. 30.	Caulking tubes	0	11	0			
April 18.	Furnace-bars	0	18	11			
Nov. 26.	Repairs	8	11	6			
					16	14	11
	Total cost of repairs for three years				£24	15	7
	Average, £8 5s. 2d. a-year.						

This engine is used to thresh, cut chaff, and grind corn, on a farm of 1,500 acres, nearly all arable, and is used nearly three days in a week.

The following are the costs of repairs of an 8-horse power engine, bought October 20th, 1856, worked about three days a week, omitting fire-bars—which have averaged £1 15s. yearly for 8-horse power engines; and £1 8s. yearly for 7-horse power engines. This engine is under very excellent management, and belongs to Mr. Willsher, of Petches, near Weathersfield, Essex.

		£	s.	d.	£	s.	d.
1857. August.	Engine looked over, and brasses	0	10	0			
"	Eccentric strap broken; new one from Lincoln	1	12	6			
Sept. 10.	New strap and eccentric, with man to fit it np	3	10	0			
					5	12	6
1858. January.	13 new ferrules to tubes, and chimney repaired	1	1	0			
"	8 new ferrules, brasses adjusted	0	17	0			
					1	18	0
1859. August.	Wheelwright, for repair of engine shafts	0	15	0			
Dec.	Eccentric strap (broken)	1	12	6			
					2	7	6
1860. January.	New ferrules in tubes	2	14	0			
April.	Patch put to fire-box, and two new stay-bolts	4	0	0			
					6	14	0
"	Fire-bars				7	0	0
					£23	12	0

1860.
Midsummer. New fire-box and new tubes, smoke-box re-repaired, &c., £45.

The fire-box of this engine lasted a much less time than usual; the cost of repairs up to the time of its renewal was £5 18s. a year.

We have selected these detailed statements of the costs of repairs from a great many similar ones lying before us, and which we omit, as they would only crowd the pages of the Journal without giving any additional information. We have returns of the cost of repairs of at least 20 portable engines, varying in amount from £4 to £14 yearly for an 8-horse engine, exclusive of the cost of new fire-boxes. When so much depends, not only on the amount of work done, the quality of the water used, the care and intelligence of the engineer, but also on the inherent difference

existing between two engines turned out of the same workshop, it is not easy to make an average estimate of the cost of their repairs.

By far the most costly item in this account is the renewal of the fire-box, which, with carriage, will cost from £35 to £45; and there is no surer test of the treatment which the engine has received, than the early and repeated recurrence of this demand. I am informed by a friend that his engine—now in its fourth year of use—already requires a new fire-box, although it has worked but once a week, and been supplied with soft water. My friend, however, is not surprised at this, because he has left the engine entirely in the hands of a farm labourer.

An eminent maker informs me that with good management the fire-box of a portable engine, used two days a week, will last at least seven years. Several instances of its lasting ten or eleven years, when used twice a week, have come within my own knowledge.

To show how much this outlay may be diminished, if an engine be well attended to and protected from dust and damp, I give the following extract of a letter received from the owners of a 5-horse power portable steam-engine, used in an adjoining silk-mill, and kept constantly under the care of skilled mechanics:—"The engine was worked in the mills about 6½ years, and about two days in the week during the whole of that period. The repairs done to it were not extensive. The tubes at the fire-ends were once caulked round to stop leakages, and afterwards eight new tubes and two new collars were put in, the cost of the whole of which was about £8." This statement does not pretend to include every item of repairs; but after 6½ years there was no sign of injury to the fire-box of this engine, showing how much the outlay depends on good treatment and favourable circumstances.

Repairs of Fixed Engines.

The following were the repairs done to an overhead 10-horse-power fixed steam-engine, fitted with extra large boiler for burning wood, in 1853, belonging to the Right Hon. the Earl of Stradbroke; price, not including fixing, £350:—

		£	s.	d.	£	s.	d.
1854.							
Jan. 30.	Repairs	0	15	0			
July 15.	Adjusting engine-slides	0	13	6			
,,	Water-gauge glass & grummets	0	4	9			
August.	Excentric band repaired	0	10	6			
,,	Furnace-bars	1	4	0			
					3	7	9
1855.							
March.	Repairs	5	3	6			
Dec.	Bars and new back	2	17	0			
,,	Screws, &c.	0	5	6			
					9	6	0
1856.	Nothing.						
1857.							
March.	A cast back to furnace and bars	1	10	6			
April.	Piston taken out and repaired	3	15	0			
					5	5	6
1858.	Bars				1	10	9
1859.	Nothing.						
1860.	Same.						
1861.							
July.	Repairs to piston, &c.				4	7	0
	£2 19s. 7d. per annum for eight years				£23	17	0

This is the only *detailed* estimate we possess, and the gross sum happens to be heavier than in any other return. On the whole, we believe that £3 per annum for the first ten years will cover the cost of repairs of an 8 or 10-horse fixed engine, well managed, and used as often as it is likely to be required on any large farm. At the end of that period the cylinder will probably require re-boring, and a general repair of the engine and boiler will be needed, at a cost of about £40.

In order to estimate the proper charge for repairs and depreciation, we must know how long the engine will last. Supposing the process of repair to be repeated, it is difficult to assign a limit to the duration of a well-made engine, simple in all its parts as a non-condensing engine is now made. We shall, however, for purposes of calculation, suppose that at thirty years old an 8-horse engine is worth £50 with its fixing, and that besides the outlay of £3 a year for lesser repairs it has in its tenth and twentieth years received a thorough repair, as before referred to, at a total cost of £80. The annual charge will thus be raised on the average of thirty years to £5 13s.

It remains for us to put a value on such an engine when thirty years old, and practically such valuations are of rare occurrence. If we estimate that an outlay of £40 will again be required for a general repair, and put a value of £50 on the engine as it stands, we arrive at the total sum of £90, or less than half price for an engine nearly as good as new. We have known a 50-horse-power condensing engine working at fifty years old, and said to be "as good as new."

Interest and Depreciation.

We must now attempt to arrive at a specific charge for the depreciation of a portable engine, however open to correction, wherewith to debit the account for threshing.

As to the value of a portable engine, ten years old and out of repair, any one who has had such a one to sell must have found it a most unmarketable article. Let us suppose it to be worth £40. The original cost of an 8-horse power engine having been £230, the depreciation of capital so invested (reckoned at 5 per cent.) is £26 13s. per annum; namely, £2 per annum, the interest of the £40 which the engine will be worth at the end of the period, and £24 13s., the value of an annuity (calculated at 5 per cent.) which could be bought for ten years for the £190, the sum supposed to be sunk.*

But besides these charges, there are certain other contingent expenses to be taken into account, such as buildings and shafts, straps and covers, which we shall include in the account of the threshing machines.

An 8-horse portable engine requires a house 12 ft. wide by 20 ft. long, by 10 ft. high up to the plate; the roof should be of galvanized iron; total cost, including large folding-doors, eaves' trough, paving, and tank, £30, which at 7½ per cent. per annum comes to £2 5s.

The building for a fixed engine should be of a somewhat more substantial character, costing about £40, and to this we add the cost of building the chimney-shaft (40 to 45 ft. high, and made square for the sake of economy), setting the boiler, foundation for engine, &c., bringing the total cost to £120. This estimate applies to the Eastern Counties; in the North it would be lower, and in the South rather greater. The rent for this building at 7½ per cent would be £9.

Table showing the probable Cost of Repairs and Depreciation for portable Steam Engines.

Horse-power.	Price.	Suppos'd Value in 10 Years.	Amount of Depreciation and Interest per Annum for 10 Years.	Amount of Repairs per Annum for 10 Years.
	£	£	£ s. + £ s. = £ s.	£ s.
4	165	30	17 10 + 1 10 = 19 0	0
5	180	30	19 9 + 1 10 = 20 19	0
6	200	35	21 8 + 1 15 = 23 3	0
7	215	40	22 12 + 2 0 = 24 12	11 0
8	230	40	24 13 + 2 0 = 26 13	11 10
10	290	50	31 2 + 2 10 = 33 13	13 10

Charge for Engine-Shed, £2 5s.

Cost of Repairs and Depreciation for fixed Horizontal Engines.

Horse-power.	Price.	Suppos'd Value in 30 Years.	Amount of Depreciation and Interest per Annum for 30 Years.	Amount of Repairs per Annum for 30 Years,
	£	£	£ s. + £ s. = £ s.	£ s.
4	120	30	5 16 + 1 10 = 7 6	4 10
6	160	35	8 2 + 1 15 = 9 17	5 0
8	200	50	9 14 + 2 10 = 12 4	5 13
10	240	60	11 16 + 3 0 = 14 16	5 13
12	280	70	13 12 + 3 10 = 17 2	6 0

Rent of Buildings, £9.

Repairs and Depreciation of Portable Threshing Machines.

Mr. Willsher's 8-horse power finishing machine, bought in 1856, has cost:—

		£	s.	d.	£	s.	d.
1856.							
October.	Straps and thongs				0	8	6
1857.							
Nov. 27.	New brasses	0	13	6			
Dec.	Straps	0	6	10			
					1	0	4
1858.							
Nov.	Machine overhauled, new brasses, and straps				2	15	9
1859.							
August.	Machine overhauled, nearly all new brasses, new straps, and repairs				6	18	0
1860.							
April	Straps and brasses	3	1	0			
Mid-summer.	Thorough repair, new beaters, new concave, new shaker and spindle-screen, spindle, brasses, &c., straps, and painting	31	10	0			
					34	11	0
	£9 2s. 9d. a-year for five years				£45	13	7

His 7-horse single-blast machine has cost:—

		£	s.	d.
1854.	Straps, &c.	0	12	9
1855.	Brasses and straps, repairs	4	3	0
1856.	Shaker-brackets, straps, brasses, &c.	4	11	0
1857.	Machines overhauled and general repairs, renewal of brasses, &c.	10	11	0
1858.	New drum and concave, general repairs, painting, and wearing parts renewed	27	5	0
1859.	Straps, &c.	1	2	6
1860.	New brasses and straps, repairs by carpenter, &c.	6	17	0
1861.	Machine overhauled, new wearing parts, &c.	9	18	6
	£8 2s. 7d. per annum for eight years	£65	0	9

The average of our returns is from £8 to £13 a year for an 8-horse-power single-blast machine, working two days a week.

Besides the items given there is the cost of driving-straps and of waterproof covers for both engine and machine. The cost of all these depends entirely on the care taken and on the amount of exposure to wet. Either a cloth or a strap doubled up wet will soon be spoiled. We have known a good strap, costing £5, last three years with pretty constant work, but a neighbouring letter-out of machines estimates his expenses in driving-straps for one machine at £4 per year, and in waterproof covers at £2.

Finishing machines, constructed with a double, or often a treble blast, have such numerous bearings and driving-straps, and are so complicated, that the cost of their repairs has been in some cases enormous. Considering the extra power, or the slower feeding, which they require, and that corn can be finished by hand for 1d. per quarter, we doubt whether their employment is generally economical.

At all events they require to be simplified, and improvements such as those of Messrs. Garrett and Son, who obtain a blast of air by a fan fixed to the drum spindle, deserve notice and encouragement. Mr. J. C. Willsher has also, with the same object, lately patented an arrangement for driving the shakers and carvings-screen, either with or without a riddle-box and corn-screen, from one crank spindle and with one strap. Messrs. Clayton and Shuttleworth have also introduced a new elevator, consisting of spades or scoops fixed on the same spindle as the blower, which by revolving rapidly throws the corn up into the second dresser and awns the barley, or chobs the wheat, so as to dispense with the straps of the former elevator and barley-awner. Messrs. Ransome's adjustable rotary screen, though ingenious, can hardly be classed among those novelties which tend to simplify the machine.

A survey of the vast amount of ingenuity which has been directed by different makers to the working parts of the machine—the drum, beaters, shakers, riddles, and more recently to the elevators—creates the impression that no one maker can claim unrivalled superiority over the rest in every respect, but rather that a much better machine would result if the *good points* in each pattern could be combined together.

None but machines by the best makers should ever be selected, however tempting a bait may be held out in other quarters by a lower price. Competition has lowered the prices to a level which will not admit of further reduction without the substitution of inferior workmanship; and this, whether a steam-engine or so simple a machine as a turnip-cutter be in question. Inferior workmanship will always prove the dearest in the end. Among other reasons for buying fir t-

* In this calculation both interest and depreciation are included.—P. H. F.

class machinery may be mentioned the importance of having the wearing parts properly numbered, so that they can be fixed by a common smith. The best makers take care to provide these for their customers; others may expose you to disappointment and expense for want of this provision.

(To be concluded in our next.)

THE PREVENTION OF DECAY IN TIMBER.*

The large excess of the annual consumption of timber over its reproduction has led the author of the essay under notice to consider what remedies might judiciously be adopted for the prevention of its decay. Although Mons. de Lapparent treats of the subject more especially in its relation to timber for ship-building purposes, his observations and the suggestions founded upon them, are equally applicable to timber used for building and railway works. The principles are the same in all cases, whether applied to the ribs of a ship, the sleepers of a railway, or the beams of a house. If, by the judicious employment of known means, we doubt the durability of the timber, we allow the young trees a proportionate length of time to reach maturity, we double, at once, our natural wealth in the material, wherever it is used, as well as from the forests in which we gather our supplies. The longer we prolong this durability, the more valuable does the timber become through the absence of any need for renewal, and the more surely do we guard ourselves against a scarcity; the disastrous effects of which are already felt in many parts of France.

With that portion of the essay devoted to ship-building, and to a consideration of the relative advantages of iron and wooden ships, it is not our province to deal, but the insufficient seasoning of the timber, which renders many new ships in a few years almost worthless, is an evil largely introduced into modern houses. The channels or space between a ship's timbers, into which there is a constant supply of aqueous vapour from the unseasoned wood, have their counterparts in the floors of our houses. The elements of fermentation, and consequently of decomposition of the ligneous fibre, are produced from similar causes in both instances. The author says:—

"Timber, sound at the heart and exempt from all accidental and local defects, only decays under the influence of certain causes, which it is important carefully to define, in order that we may be enabled to combat them successfully.

"When a tree is felled it encloses in its fibres as well as in its capillary channels a considerable quantity of sap, which is nothing else but water charged with gummy, saccharine, saline, mucilaginous, and albuminous matters. In this state the latter are very liable to ferment, but they lose this liability when, by the evaporation of the sap, they pass to a dry and solid state; so that the first suggestion which naturally presents itself to the mind, is to subject the timber to a lengthened seasoning.

"Unfortunately timber in general, and particularly that of the oak species, requires a prodigious long time before the mass is thoroughly seasoned. This arises partly because (the wood being inaccessible to heat) the sap, excepting that immediately below the surface, does not exude in vapour —the only form in which it could escape quickly— and partly from the incrustation and the narrowness of the channels, which present a more or less powerful obstacle to the evaporation of these exhalations.

"A natural seasoning would be sufficient for specimens of moderate thickness, such as boards for inlaying and panelling, &c., &c., or even for some thicker woods, from which in working up they take off only a thin shaving from the surface—for example, the planking of ships; but it would be entirely useless as regards rough square logs intended to be used as ribs, and from which from 40 to 50 per cent. of the original mass is taken off. Then, however seasoned the exterior may appear, a considerable degree of dampness is found under the fibrous tissue of the wood. Exposure of the timber to free air for some length of time can alone remedy this evil."

But as our inability to wait a sufficiently long time for the natural seasoning of the timber has been the cause of our employment of an inferior quality, it is practically useless to insist upon, and rest content with, that means of attaining our object. We must resort to artificial and speedy methods for obtaining similar results. Mons. de Lapparent's methods consist:—

1st. In depriving the timber of the greatest possible quantity of sap, and consequently of the fermenting principles therein contained.

2nd. In subjecting felled timber, before putting together, to an artificial seasoning.

3rd. In charring or scorching the surface of the wood by means of a slight carbonisation when the work is finished.

These different methods are examined and elucidated in regular order. The well-known fact that wood dries more rapidly the longer it has previously remained under water, is explained with remarkable clearness. The water, constantly changing all round the submerged timber, concludes by taking the place of the sap which issues forth and carries with it the fermenting properties with which it is charged. Then as pure water evaporates much quicker than that which contains foreign matters, the previously submerged timber is sooner seasoned. The time required for timber to remain under water, in order to get rid of its sap, is estimated by the author at one year in river water, two years in fresh water frequently changed, three years in brackish water always changing. Boards thus prepared would, after being left subsequently to season themselves naturally in store for two years, be ready for working up, but "rough timber for ribs" needs an artificial seasoning.

The various plans for artificial seasoning are then explained, and with them their defects. The plan of injecting gradually-heated air into the drying-stove where the wood is placed, leaves the inferior fibres of the wood of their original bulk, whilst those near the surface have a tendency to shrink and cause cracks and splits of more or less depth. This results from wood being such a bad conductor of heat. The heat cannot reach all the fibres alike. M. Guibert's method obviates this defect by "filling the drying-stove with smoke produced by the distillation of certain combustible matters such as saw-dust, waste tan, smiths' coal, &c. The distillation of the combustibles causing a discharge of steam, prevents the cracks and splits in the outside fibres of the timber.

Another method is the injection of sulphate of copper into the timber.

The principal cause of fermentation—the forerunner of decay—is, it appears, the presence of an atmosphere of warm, damp, and stagnant air:—

"On one of these three conditions being removed, the durability of timber would be immediately prolonged. Thus it is that we cannot contemplate without a feeling of admiration the woodwork of the oldest mansions or churches. To quote from Rondelet: 'The woodwork of the church of St. Paul, outside the city walls, which was destroyed by fire in 1823, was erected as far back as the fifth century. Although the atmosphere surrounding the framework is often at once warm and damp, yet it is never stagnant.' It is also known that timber has been preserved indefinitely under water. It may lose a portion of its elasticity and power of resistance by the absence of some of its properties, but it does not decay.

"The joists of the houses built by our ancestors last almost for ever, because they are in contact with air which is continually changing. Now, on the contrary, we foolishly enclose them between a ceiling of plaster (always very damp to begin with) and a floor; they rapidly decay, and sometimes cause the most serious disasters, of which it is impossible to be forewarned."

The signs of decay in timber are fungi, and the fermentation generated by prolonged contact with warm, damp, and stagnant air, is as a soil where seeds sow and nourish themselves.

The remedies are, consequently, to disturb the stagnant air, to get rid of the confined air in contact with the timber, to so prepare the surface of timber as to prevent the engendering and growth of fungi, and to impregnate the air in contact with timber with a substance destructive to the sporules of the fungi:—

The first remedy explains itself. The second consists in carbonizing the surface of the timber:—

"In the first place, the surface is subjected to a considerable heat, the primary effect of which is to exhaust the sap of the epidermis, and to dry up the fermenting principles—here this is done by long exposure to the air; and in the second place, below the outside layer, completely carbonized, a scorched surface is found, that is to say, partly distilled and impregnated with the products of that distillation, which are creosoted and empyreumatic, the antiseptic properties of which are well known."

Numerous instances of the efficacy of this method are given, for details of which we must refer the reader to the essay itself, where he will also find particulars of the cheap and simple apparatus by which the author disposes of all danger in the use of his process. The operation of charring the timber is facilitated by previously smearing it with a little tar:—

"By so doing these other advantages are gained—

"1st.—The carbonization of the cracks, that almost always occur on the surface of rough timber, is facilitated.

"2ndly.—It prevents the timber being affected too suddenly by the heat of the gas, which causes it to split.

3dly.—It prevents the cracking and splintering off of little ignited particles.

"But beyond a mere facing of tar we must not go; a little thicker layer would impede, instead of furthering, the operation. Besides, we must stop as soon as the surface is freely carbonized, which certifies that none of the parts below have escaped the charring, which is, I repeat, the end we seek."

It is suggested—and the suggestion is well worth consideration—that this process should be applied in house building:—

"In house-building, the process should be applied to the beams and joists embedded in the walls, or surrounded with plaster; to the joists of stables, cowhouses, washhouses, &c.—which, although exposed to the free air, are constantly surrounded by a warm and moist atmosphere, an active cause of fermentation—to the wainscoting of ground floors; to the flooring beneath the parquet work, to the joints of tongues and rabbets, &c.; for carbonization by means of gas still leaves to the wood, for working purposes, all the sharpness of its edges.

"By carbonization a practical and economical means is offered to railway companies of preserving, almost for ever, the sleepers, particularly oak, which cannot be impregnated by the injection of sulphate of copper. Let us suppose, for instance, that after, say 10 or 15 years, the sleepers on a line are taken up for the length of a mile, and replaced by new ones, the old, when rasped and burnt again, will serve for the replacing of the following mile, and so on, one mile after the other."

The charred timber, after being scraped and pumiced, may be painted in the usual way, and with any colour.

The impregnation of the air in contact with timber is managed by smearing, here and there on the surface, a species of paint, with flour of sulphur as a basis, and linseed oil as an amalgamator. This paint developes a slightly

* "An Essay on the Prevention of Decay in Timber for Ship Building and other Purposes," by Mons. de Lapparent, Officer of the Legion of Honour, Director of the French Dockyards, and Inspector of Timber for Naval Purposes. London: M'Kewan and Co., 46, London-wall.

sulphurous atmosphere, which purifies the air, by destroying, at least in part, the sporules of the fungi.

Such is an outline of the means pointed out by Mons. de Lapparent. They are, as he says, simple, logical, economical, easy of adoption, and perfectly innocuous. The arrangement for working Mons. de Lapparent's patent in Great Britain, has been intrusted to Messrs. York and Co., 32, Royal Exchange-buildings, where the system may be seen in operation.—*Building News.*

DISC GUNS AND PROJECTILES.

The following paper was read in Sect. G, at the meeting of the British Association on the 3rd October, by R. W. Woollcombe, Esq., of St. Jean d'Acre-terrace, Stoke, Devonport:—

Oblate Projectiles with Cycloidal Rotation, contrasted with Cylindro-ogival Projectiles, having Helical or Rifle Rotation.

Although a paper entitled "An Account of some Experiments with Excentric Oblate Bodies and Discs as Projectiles" was produced by me in March last, before the Royal Society, and was printed in their proceedings for May, yet the results of some further experiments with a model at Shoeburyness, as to penetration and velocity, appear to me of sufficient interest in a practical point of view to be brought to the notice of the British Association.

It appears that in gunnery the requirement of the day is some arrangement by which, in one shape or other, heavy solid shot can be projected with high initial velocity, yet such velocity be maintained better than it can be in spheres.

While ships were of wood there was a requirement for powerful and capacious shells, and such projectiles were forthcoming by the rifle principle, but (abiding the results of the progressing trials with Mr. Whitworth's punch-headed shells), the iron plates may be said to have brought solid shot into the foreground. Rifled cannon, it appears, cannot project heavy elongated shot with high velocity, and it is seen (again excepting Mr. Whitworth's results with flat-headed projectiles), that for the penetration of iron plates a high velocity is essential—at least within the more manageable weights—say up to 120 lbs. It seems that for heavy shot we have of late reverted to spheres, and thus, after an acquaintanceship not of many years' duration, have so far taken our leave of science for the solid projectile, retaining her aid only far the building up of Cyclopœan smooth-bore cylinders. A return to the smooth-bore cylinder would not necessarily be a retrogression; it might be an advance in science could we successfully project from the smooth-bore shot that are elongated; it is in the abandonment of elongation for the projectile that science has retrogressed. If, then (with the exception still under trial), we find that from neither rifled nor smooth-bored cylinders we can advantageously project, in respect of iron plates, heavy elongated shot, are we compelled by the requirements of the hour, therefore, to forego for the larger calibres the many advantages we have learned from the smaller calibres to appreciate in elongation? The question presents itself: "What is there in the rifle principle and in elongation by the cylindro-ogival form that appears to bar development,—that prevents a natural expansion from small to great calibres,—that in * practice makes the 80-pounder give scarcely more range than the 3-pounder, and but just now, when called upon for great action, has made this principle give place to the primitive sphere and smooth-bored cylinder?"—the reason may, I believe, be found in the artificial basis of the rifle principle. However well-suited the helical or rifle method with cylindrical elongation for the projectile may be for small arms, and for, perhaps, the lesser calibres in cannon, yet when we desire to so far imitate nature as to project with great and sustained velocities great weights, we might succeed better were our mechanical arrangements less antagonistic than are those of the rifle principle to certain great laws of nature, to the laws which have ruled in the form, method of rotation, and translation of what I may here term the great natural projectiles—the planets. Do we find any one of these to be a prolate body, projected with helical rotation about its longest diameter, and in the direction of such axis? In the two first conditions, namely, the prolate form and helical rotation, we have, I think, the clue to the small initial velocity afforded by, and inexpansive nature of, the rifle principle; and in the third condition, or the axis of rotation lying in the plane of projection, is the reason why the rifle principle has not done, and never can do, anything to improve vertical fire, or to be in any calibre effective dynamically except at very low elevations, a matter of no consequence in small arms. These defects are inherent to the rifle principle. Is there any other arrangement practicable in which, by a construction less in violation of the natural laws alluded to, the defects spoken of in respect of rifled cannon may not exist? In reply, I have to say that I have found it to be practicable to project a body that is, instead of being prolate, more or less oblate; that instead of having helical rotation at *the expense* of translation, has cycloidal rotation *in aid* of translation; a projectile that rotates about its shortest diameter, or the natural axis of rotation of a body naturally formed for rotation, instead of about the longest diameter of unnatural axis of a body not formed for rotation; that while the projectile has a circular periphery in line of motion in the gun, and can thus leave the bore as freely as a common round shot, yet has the additional security for high initial velocity of windage much† smaller than could be allowed for round shot of similar weight. That is, like the round shot, driving through the gun along a straight smooth bore, but as a wheel, instead of being forced into and through a helix as a screw, and thus conditions for a vast superiority in initial velocity given to it over the rifle projectile, and from the diminished windage much superiority in initial velocity over the sphere. The terminal velocity being also provided for by the oblateness, and for any elevation ‡ by the axis of rotation being transverse to, and not in the plane of the trajectory.

The gun being of similar transverse section to that of the projectile, the bore, as has been said, straight and smooth, the longer axis of the bore in a direction perpendicular to the common axis of the trunnions. The gun to be fired with the trunnions as horizontal as possible, as indeed all guns are. The projectile a disc, scarcely more costly in manufacture than a common round shot, and which is fit for use almost in the state in which it is taken from the mould. It must be slightly eccentric or it will not rotate. I find that not more than 1-50th of the concentric weight need be added or subtracted to secure rotation (less than 1-100th has given rotation in a disc). All *spherical* shells used by the American Federal States are purposely made eccentric by about a similar amount. All spherical shells are *inevitably* eccentric, so are ninety-nine out of a hundred spherical shot. I merely propose to apply to an advantageous purpose an eccentricity scarcely greater than is *inevitable* in any spherical projectile, and by such means to secure and multiply the advantages of virtual elongation by the cycloidal rotation of an oblate body instead of the helical rotation of a projectile elongated cylindrically, by which is to be, I believe, secured an initial velocity greater than that of a sphere *in a ratio increasing with dimensions*, and the conditions are afforded for maintaining such velocity at *any* elevation better than can be secured by the use of the rifle principle. I will mention briefly the results of some experiments shown to the Ordnance Select Committee in March last, with a small rough model. The gun was only $20\frac{1}{4}$ inches long in the bore, or $10\frac{3}{4}$ calibres in length. The calibre (long diameter), being about $1\frac{7}{8}$ inch, and the transverse or short diameter about $\frac{3}{4}$ inch. The shot weighed between $7\frac{3}{4}$ and 8 ounces. The experimental gun being externally a mere cylindrical block, weighed more than would have been otherwise necessary, and from also been of necessity built up and not bored, its weight was about 130 lbs. With a charge of $2\frac{1}{4}$ oz. or about 3-5ths the shots' weight, the penetration of 25 yards from an oak target was a mean of 11 inches reckoning to near side of disc, and to the far side nearly 13 inches. The initial velocity which gave this penetration was, as measured by Havez, Electro Ballistic Apparatus, 1,487 feet per second. Desirous of comparing a spherical shot with mine, the Ordnance Select Committee fired a few shots with a small brass gun, the length of bore of which was 34·625 inches, and nearly double the length of mine in calibre. The mean calibre of the committee's gun was 1·60 inch, but at the muzzle something more. The mean diameter of their shot was 1·48 inch. Fired with proportionate charges, the penetration of the disc gun was more than double that of the committee's gun in the oak, and its initial velocity as 1,487 to that of the committee's, 1,091.

The mean penetration of the committee's gun being 5 inches, that of mine 11 inches.

In these trials at the oak, all the discs fired with centre of gravity "above" in the bôre struck upright as fired.

At a subsequent trial for velocity some discs were fired which were laterally as well as longitudinally eccentric, and though they evinced by the holes in the target confirmed rotation on the desired axis, yet this rotation was not in one plane. At close quarters this would be immaterial, as the penetration is not effected, and I believe it to be very practicable to make discs sufficiently symmetrical and homogeneous laterally.

Excepting when the trajectory was square or perpendicular to the plane of the target, a condition that must be, I presume, very rare in actual service, a disc would have almost the advantage that a flat-headed cylindrical projectile has in respect of contact over one with a hemispherical or ogival head, while for the reasons I have already named the disc is likely to have a much greater velocity than any rifle projectile, in which case more effect is probable against iron-plates.

I will conclude by mentioning that even with this short model of 20 inches long, or $10\frac{3}{4}$ calibres, the velocity has approximated to that from the 68-pounder of 95 cwt., viz:—1494·4 feet per second as compared with 1553·3 feet per second, the former at 60 feet from muzzle, the latter at 90 feet, the former with $\frac{1}{3}$ of discs weight, or 2·625 ounces, the latter with 16 lbs charge, or about $\frac{1}{4}$ shot-weight.

I think, then, that having in view the great requirement of the day, in respect of projectiles, viz., the conditions for effecting the penetration of iron plates, it may, considering the above results, already appear worthy of regret that the subject has been permitted by the military authorities to fail to the ground without any further trial.

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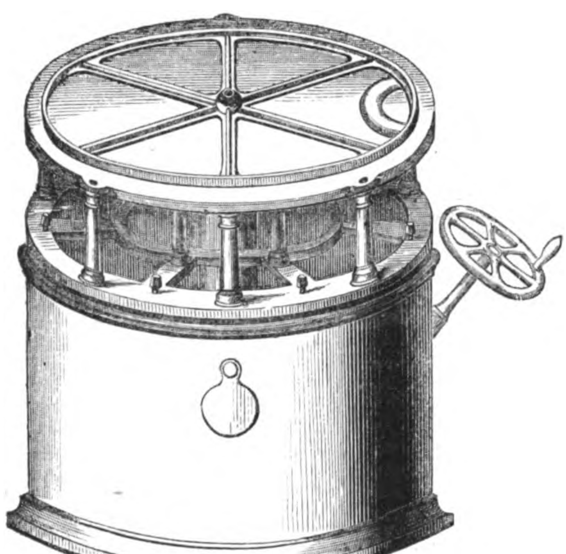
* Vide *Times* of Feb. 20th, 1860, for report of the Southport experiments:—Whitworth's 3-pounder at 5 degree elevation, gave 2,500 yards; 80-pounder at 5 degree elevation, gave 2,544 yards; each with a charge of about one-seventh the weight of projectile.

† For a round shot must be allowed a larger margin (windage) for defects in sphericity, than need a disc. The latter need only slide freely laterally, and can roll but on one axis. The round shot must have windage enough to roll on an infinite number of axes.

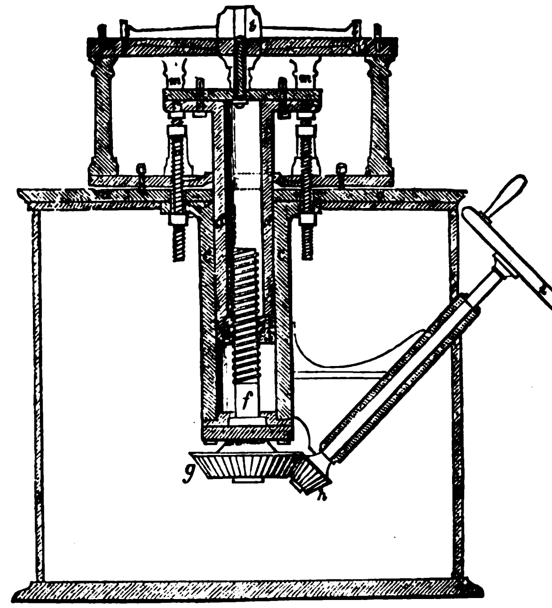
‡ As to the requirement of the tangent to the path does not obtain in the discs.

Forty cast iron guns, strengthened on Capt. Blakely's principle of wrought iron hoops shrunk on over the breech, and rifled according to Commander Scott's system, by order of his Highness the Viceroy of Egypt, were recently thoroughly tested at the Arsenal Butt, Woolwich, and, having passed proof, they were sighted in the Royal Gun Factories, and completed. They have been despatched to Alexandria for the service of the Egyptian Artillery. An additional number of guns on the same principle were fired at the Royal Arsenal Butt, with a heavy charge of powder and shot, having been purchased by the Pasha on the usual conditions, and will be completed in a similar manner.

MOULDING APPARATUS.



aa The table.
bb A cylindrical stand.
cc A hollow cylindrical guide.
dd A hollow sliding mandril or piston.
f A screwed shaft.
gh A pair of bevilled wheels.
i A handle wheel.
kk A moulding or ramming plate.
ll The pattern.
mm Pillars to support internal portions of moulding plate.



ON MOULDING IN METALS BY MACHINERY.

We all are aware that in these days the machinery used in many branches of industry is getting consolidated in form and extended in application, and that we are continually exporting absolutely the same machines north, south, east, and west. There need be no apology, therefore, for enlarging upon the means used for manufacturing quickly and well the major part of the details of all machines.

Cast malleable iron and cast steel are also every year getting into extended use, and the foundry seems destined to play a more and more important part in well-conducted engineering establishments.

The alliance of chemistry and mechanics will no doubt be fruitful in further combinations, giving us more extended powers in practical metallurgy; causing us to rely more on what may be termed the "plastic" powers of the cupola, and less on the brute force of the hammer, for the development of mechanical conception.

In our volumes for 1856 and 1857, and since, we noticed several moulding apparatus, then new, but which have since fully justified the expectations we formed at the time respecting them; we now purpose to compare more fully several of the most successful ones that have come under our observation.

Success makes machinery as well as statesmen and generals; and to attempt to criticise all the schemes that have passed the "ordeal" of the Lord Chancellor's seal, might perhaps be interesting in certain respects, but would certainly tire the greater part of our readers.

It may be at once mentioned that, as yet, all these processes are more particularly applicable to a repetition of work. It will not pay to have a sewing machine to sew only one shirt. Those large workshops, therefore, that are so fortunate as to have this repetition, the sure road to wealth for a manufacturing engineer, have, most of them, one or the other of these more or less economical contrivances. As might be expected, we find them largely applied in machine shops for the manufacture of cotton, flax, and woollen machinery, and also agricultural implements. In what may be termed the "brickmaking" of the trade, the manufacture, namely, of railway chairs, pavements, shot and shell, where the great call is for rapidity of production, the use of a good moulding machine is of imperative importance. The application of machinery to these purposes brings, of course, the usual advantages in its train, not merely increased rapidity of production, but also the substitution of cheap labour for that of skilled artisans, superior finish and accuracy of the castings, diminished cost of trimmings, and considerable reduction in the cost of fitting up the details. Some of these machines have even additional special advantages, to be mentioned further on.

In 1850 and 1851 Sir Peter Fairbairn, of Leeds, and Mr. John Hetherington, of Manchester, together took out a patent, in each respective year, for their process, now well known under the name of "plate-moulding." According to this plan, still in extensive employment, the pattern to be used is first bisected or divided into two parts through the broadest face of the pattern, these two parts being severally attached to the opposite sides of an intermediate plate, being fixed on this plate accurately coincident, or opposite each other. This plate and the halves of the pattern thereon are then placed between two upper and lower mould boxes. The parts being correctly adjusted, the process of ramming sand into one of the boxes will produce half the mould. The whole, boxes, patterns, and plate, is then turned over, and the same process is repeated with the second box. The plate, with its pattern, and the box which happens to be uppermost is now lifted off and turned over, the bottom box being thus left clear. The mould in the two boxes, on being put together, will thus be ready to receive the molten metal. In patterns with any "undercut" or overhanging projections, these parts are fitted loosely to the pattern-plate, and left behind on lifting off the plate, to be afterwards withdrawn. Any cores required are of course placed in the usual manner. This process has, as we mentioned before, been in extensive use for the last ten years, particularly in Manchester, Leeds, and the surrounding districts. We are assured that it, in certain cases, turns out work at one quarter the usual cost.

Messrs. Howard, of Bedford, in 1856, brought out and patented some different arrangements for these purposes, half of the pattern being withdrawn from below by means of mechanism. The moulding plate is cut out to the shape of the pattern, like a stencilling plate, and it rests on a table, as shown in the above cuts.

The moulding-box being placed upon this plate, the pattern is worked up so as to protrude to the required extent through the opening. The sand is then thrown in, and rammed up in the usual way. This being done, the operative lowers the plate by means of a hand-wheel, working a screw or a rack. An exact impression is thus left by the pattern in the sand. The mould is then free to be lifted off in the box, and turned over, ready for the other half. The process is repeated or not, on the same table, fo this other half, according to the shape of the pattern. Similar plans to this had been used by Government, for moulding shot and shell, several years before this patent was taken out. Mr. Howard more particularly specifies arrangements for supporting those portions of the plate for sustaining the sand used in the interstitial vacuities of any pattern. For instance, the isolated opening within the rim and arms of any pulley.

A great number of these machines are said to be in use by the patentee at the Britannia Iron Works, Bedford, chiefly for plough frames and wheels. These works are the most extensive ones in the kingdom for ploughs—taking the same position in that trade as Clayton and Shuttleworth, of Lincoln, in engines and thrashers. There are several machines somewhat upon this general plan in the Exhibition.

One of these, No. 1,723 in the Catalogue, is exhibited by Mr. Stone, of Deptford. It is for moulding the brass nails for ships, &c. The machine forms the moulds for about 500 at a time. It consists of a brass moulding plate with as many prominences as nails intended to be cast, shaped like the heads of the nails. Each of these has a hole in it, and on pressing a lever, a point is brought up through each hole; each point with its small fixed disk at the bottom forming the entire shape of the nail. To take a mould from these, a box is applied to the plate, and the same rammed down. The points are then withdrawn, and the box removed and turned over. The channels for running in the metal are formed by counterpart projections between each separate nail-head.

Two moulding machines for the 40-pounder Armstrong shells are shown at Messrs. Greenwood and Batley's stand in the Western annexe of the Exhibition. Another machine for moulding the peculiar small segments used in Armstrong's shell; and two other machines for moulding the 32-pounders diaphragm shell are shown in Class 11, Military Engineering. We believe that all these were fitted up at the Royal Laboratory Department. They consist essentially of a frame, on the top of which is a cast-iron table, with a tray at the side as a receptacle for the sand. At each end there is a circular moulding plate cast on the table. Underneath each plate is a vertical slide, actuated by a rack pinion and lever. The top part of this slide is shaped into a cast-iron mould, a counterpart of the shell or shot, elongated or spherical, as the case may be. This mould protrudes upwards through a hole in the plate on the table, fitting exactly into it. The plate is accurately turned up to receive a circul r moulding box. The joint part of this box

corresponds to the turned part of the table, and is held firmly down on each side by means of two swivelling cramps. The box being in this position, the pattern is worked up to its proper height. The sand is then thrown in and rammed down. The pattern is drawn back through the hole in the table, the cramps swivelled on one side, and the box turned over.

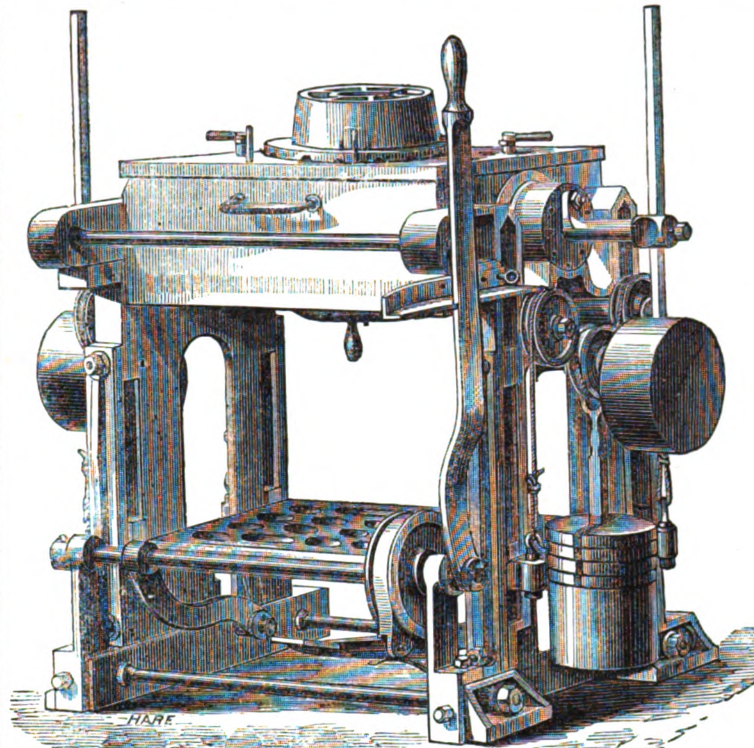
The bottom part of the shell is done in the same manner at the opposite end of the table, at the same time. The two parts are now ready for the core, and the two boxes being fixed together, the shell is ready to be cast.

The core is made in a somewhat different way on a separate machine.

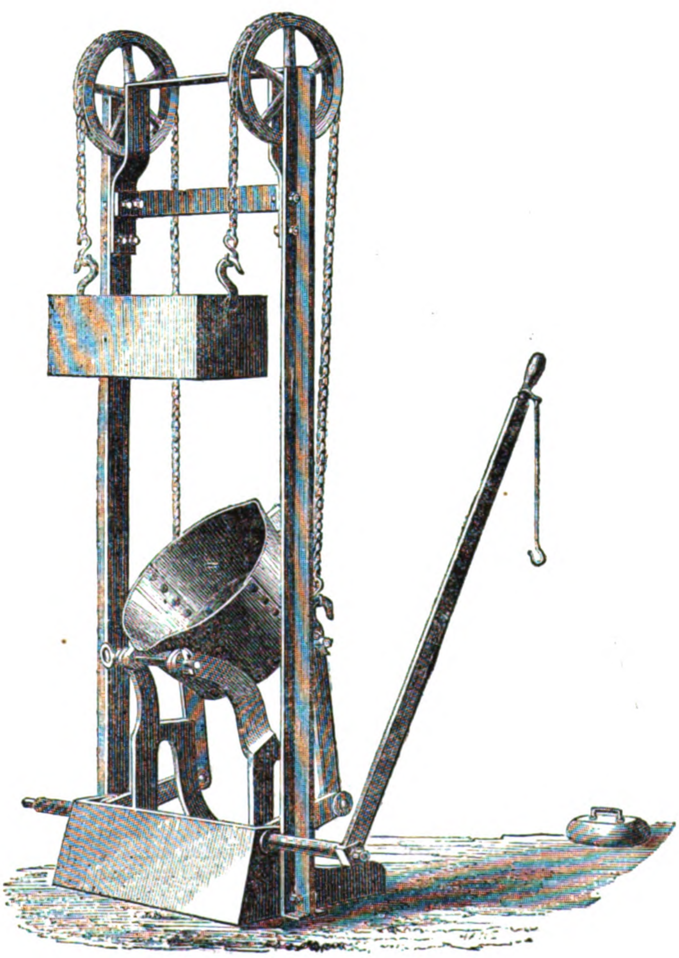
Two slides moved horizontally by a right and left-hand screw are each fitted to one half of a mould, which halves, screwed together, form the complete core. The gas-pipe core barrel is first placed in position and the sand is then thrown in and rammed down. The mould halves are then opened by turning the screws, and the core is then ready to be taken out and dried. The machine for moulding the segments of the Armstrong shells is exactly similar in principle to those above-mentioned ones for casting the bodies of shells. A number of models of the segments are raised and lowered through the moulding plate on the table. We believe that these machines are modifications of those introduced into the Royal Arsensal in consequence of the Crimean War. At that time considerable difficulty was experienced in procuring these projectiles, not only in sufficient quantity, but of sufficient accuracy to meet the requirements of the service. This, together with the high prices demanded by contractors, determined the War Office to ask a few leading mechanical houses to compete for a good moulding machine for shot and shell, and the one arranged by Mr. Greenwood was selected and adopted. Since that time a number of these machines have been in use, and have produced those piles of shot and shell which cover so large a space within the arsenal.

It is evident, on reflection, that in the machines we have just now noticed there must be a great objection at present, from the fact of the sand being *above* the pattern and *over* the opening in the plate when the pattern is being removed. It is thus very liable to fall back by its own weight and by the friction of the receding pattern. The results of this are of course an immediate injury, or even complete destruction of the mould, and similar effects, in course of time, on the whole machine.

The worst part of the labour of the moulder, on the usual plan, is the strain and fatigue



MOULDING MACHINE.



CASTING APPARATUS.

involved in lifting up and turning over the moulding box. We will now give a slight account of some moulding machinery that appears to us to meet these objections, at the same time offering advantages peculiar to itself. The figure shows a view, in perspective, of this machine, first brought out by Mr. Robert Jobson, of Dudley.

The moulding table or bed consists of a rectangular cast-iron box, open at top and bottom, and furnished with a large cylindrical axis at each end, about 6 in. diameter, turning in bearings on the side frames. The axes are prolonged at the ends, and counterbalance weights are attached to them by arms, which can be readily adjusted by lengthening or shortening, so as to balance the table with the mould upon it, leaving it free to turn upon the axes. The table turns half round, being prevented from turning further by stops upon the end of the moulding table, which catch in notches in the top of the frame. On the top of the table a plate is fixed by screw bolts, carrying the moulding box, which is secured upon it by two inclined catches with handles; this plate forming the ramming board upon which the pattern is fixed; and the moulding sand is rammed upon it in the ordinary way.

The machine is shewn as arranged for moulding *iron pavements*. Any other pattern can, however be readily employed, the only preparation requisite being to fix each pattern upon a bottom plate, having bolt-holes to correspond with those on the top of the moulding table. This arrangement is so simple, that after the machine has been moulding pavements, it can be changed and got to work again at moulding railway chairs or other articles within ten minutes time. As soon as the sand is rammed, the cover-plate is put on the box by sliding it on the inclined snugs which hold it flat; the whole is then turned over with the moulding table into the reversed position, this being effected by the simple pressure of pushing home the cover plate, since the whole is balanced and turns freely upon the axes. In moulding pavements, the pattern is then withdrawn from the mould sufficiently to make it clear the sand by means of the screw and hand wheel. A rising platform, which slides in vertical grooves in the side frames, is then brought up by means of the lever to touch the cover plate of the box which is now at the underside, and the box is liberated from the moulding plate by releasing the two catches simultaneously by means of the second handles fixed on the other ends of the spindles for the purpose. The platform now descends by means of the additional weight upon it to the bottom, the platform being counterpoised by the balance weights.

The mould is then removed by sliding it off the platform on to a little railway placed at the same level; and the machine is made ready for repeating the operation by screwing down the pattern to its right place, and turning back the moulding table to its former position, ready to receive a second empty box.

The principle carried out in this machine, of turning over the whole moulding table with the mould and pattern upon it undisturbed, has the effect of saving almost all labour in lifting the moulds; so that boys, who are sufficient for all the actual moulding work, are able to complete the process, instead of men being required to lift the heavy weights. An advantage in average quality of work and saving of wasters is obtained by avoiding all handling and risk of disturbing the moulds in lifting them off; they simply slide along a little smooth railway from the moulding machine to the casting ladle, which is fixed within 7 ft. 6 in. distance from the moulding machine centre to centre. An important point is also gained, as we mentioned before, by always replacing the pattern in its first position while still inverted, thus preventing any particles of sand from interfering with the working parts of the pattern. It is an essential point in machinery applied to such purposes as the present, that it should be arranged so as to keep in order for continued regular work, without requiring any nicety in management that would interfere at all with the roughness of manipulation inseparable from work, where economy of manufacture combined with accuracy in the castings are the objects to be accomplished. The result of the working of the moulding machine is such, that one mould, consisting of two railway chairs, is completed every minute on one machine; and the machine is found to keep so well in working order that the regular day's work of ten hours produces from 1,000 to 1,100 chairs, being at the average rate throughout of two chairs per minute. This rapidity of moulding by the machine could not be made fully available with the ordinary means of casting, on account of the large floor space required for casting with the necessary rapidity, and the consequent delay and expense attending the removal of the moulds over that space; and a great objection experienced at first in regard to economy of work was the large number of moulding boxes to keep even one machine going at the full rate. To meet these difficulties a casting apparatus was designed by Mr. Jobson, which is fixed close to the moulding machine; this is capable of filling the moulds as fast as they leave the machine, and within two or three minutes the operation of moulding and casting is completed in each case, and the box laid out in the open air to cool, ready for emptying and using again on the machine within about six minutes time.

This casting apparatus is shown in perspective in the annexed figure.

The ladle is placed in a standard frame upon the floor, the sides of which partly embrace the front of the ladle, as shown, and they carry a spindle at their extremities, which passes through two corresponding lugs fixed on the front of the ladle just below the lip. This spindle forms an axis upon which the ladle turns when pouring, and the ladle is lifted by means of a shaft fixed across the centre of the bottom and connected by links to the two levers, which are fixed on the cross shaft and moved by the hand levers shown. The weight of the loaded ladle is counterpoised by balance weights attached by chains hooked on to each end of the shaft and carried over pulleys upon the roof timbers or frame of the ladle. From the position of the axis on which the ladle turns, the lip of the ladle follows the direction of the stream of metal all the time that the ladle is being turned to its extreme position shown by the dotted lines, so that the position of the stream of metal is stationary in all positions of the ladle; the several moulds are therefore only required to be brought to the same spot in succession, and the metal can be poured in at once without any delay for adjustment of position, the moulds being filled as fast as they can be brought up to the ladle from the moulding machine. The command over the movement of the ladle given by the long lever makes the pouring of the metal very steady; and the whole being nearly balanced, the caster tilts the ladle with one hand whilst he skims the metal for himself with the other. A supply of fresh metal is brought from the cupola at regular intervals by a couple of labourers with an ordinary double-handed ladle.

In casting railway chairs by hand labour, it is considered a good day's work to obtain 300 castings from one man and his boys; and with the best plan the average does not exceed 480 per day. To produce this quantity the man who rams up the bottom box has to lift the following weights:—

Bottom box	26 lbs.
Patterns	45 lbs.
Sand	48 lbs.
Ramming board	12 lbs.
Total	131 lbs.

This total weight of 131 lbs. has to be divided by 2, as the box rests upon its edge while being turned over; therefore 131 lbs. divided by 2 = 65 lbs. After turning it over the man has to

Lift off the ramming board	12 lbs.
Draw the patterns	45 lbs.
Carry the box full of sand to the casting stage	74 lbs.
Add 65 lbs. brought forward	65 lbs.
Total	196 lbs.

which, multiplied by 240, the number of boxes moulded to produce 480 chairs, 2 chairs in each box, gives 47,040 lbs. or more than 20 tons to be lifted by the man during his day's work.

By using the turn-over table, a man has been regularly making from 1,000 to 1,100 chairs per day, in producing which he had to lift only the empty bottom box and cover plate.

Bottom box	26 lbs.
Cover plate	9 lbs.
Total	35 lbs.

which, multiplied by 550, the average number of boxes moulded, 2 chairs in each box, gives 19,250 lbs. or only 9 tons to be lifted in making the larger quantity, against 20 tons in making the smaller quantity by the old plan, the latter requiring accordingly about 5½ times as much labour in lifting per chair produced as is necessary with the machine.

With regard to the casting: by the ordinary plan of carrying the iron and pouring it into the moulds, for casting railway chairs, six men and three boys were required to each table, and a long length of rails, together with a much greater number of boxes; but by the new ladle one man is enabled to cast all that can be moulded on one table, and two metal carriers are sufficient for two tables; so that two men can in this department do the work of nine men and boys, and with less labour, since they have not to stand in a constrained position with a heavy weight, as they were compelled to do in filling the moulds by the ordinary hand ladles. Also the quality of the heat of the iron is greater from its being constantly supplied; and its purity is increased by being stirred up every time the hot metal is poured into the ladle.

We believe that this machine is getting into extensive use, not merely in England, but also in foreign countries. Amongst other firms in England, Messrs. Ransome and Sims, of Ipswich, had, we believe, 20 of these machines with a turn-over table in 1860. We believe that the number has since been increased. That firm state that they use this invention for "railway chairs and iron pavements, also for tooth wheels and machine castings, spring shoes, and railway castings generally."

Messrs. Platt Brothers, of Oldham, we believe, also use it very extensively for the innumerable small castings required in the spinning and weaving machinery they send to all quarters of the globe. An extraordinary saving in fitting up these machines is said to be effected from the fact of of there being no taper required in the patterns. The working of gearing cast in this way must be much sweeter from the parallelism of the teeth. When gearing is trimmed up to effect this, the casting is necessarily weakened in the process by the loss of the outside skin. As is well known, the presence of this skin, from its harder substance, also materially lengthens the duration of the teeth. As is usually the case with a useful thing of this kind, it has been combined with other inventions, and several improvements have been grafted on it. For instance, in order to form cheaply and accurately the moulding plate used in toothed wheels, the opening in the plate is made somewhat larger than is required for the passage of the pattern; and afterwards, when the latter is in its place, a fusible metal is poured into the space between the pattern and plate. There will thus be a perfectly correct fit between the two, this accuracy being acquired at very little expense.

We have also seen the turn-over table applied to what is called "block moulding"—a process well-known to most iron founders, having been in use for some years. This plan is particularly applicable when a number of articles of a very irregular shape are required. The irregular shape of the pattern requires, of course, great skill in the operative and much time, even when the greatest skill be employed. The pattern is taken, and two of the so-called "blocks," the respective counterparts of the top and bottom of the pattern, in all their intricacies, are formed from it by a peculiar but simple process. These "blocks," being principally formed of Roman cement, last for a long time, and, in a repetition of articles, the highest skill of a journeyman is thus transmitted to any boy.

In the operation of moulding, the boxes are simply placed on each of these ramming blocks, the sand rammed in, and the two sand moulds thus made are placed together. To form the complete mould for receiving the melted iron, suitable passages for the purpose are left in the sand.

Amongst several other additions that we might mention, Mr. Barrett, of Stockton, has applied a large turn-table as a means of communication between the different machines, the casting ladle and the railway for carrying off the completed castings.

It is our belief that these machines will take a place amongst regular workshop tools, as we have no doubt that the same machine can be employed for a variety of work during the same day. If we are not too sanguine, we might even predict that these machines may cause similar changes in the foundry to those effected by the slide rest in the fitting shop. Similar to the slide rest, the turnover principle diminishes both the skill and the labour required.

This principle, applied to moulding machines, seems to us one of those arrangements general in their nature, and dependent upon a simple mechanical contrivance for their realization, that give real value and strength to a patent. To make our meaning clearer, we might, perhaps, instance Mr. Fowler's plan for making his ploughing anchor self-acting by means of the traction rope.

Any mechanic, with the right to use the traction-rope in this way, might no doubt work the anchor forwards on a variety of plans. Mr. Fowler, being the proprietor of the patent, embodying this principle, is thus, however, ahead of any other inventor. In these times of "patented invalids" this is no slight consideration.

II.

Col. Henry James announces that they have, at the Ordnance Survey Office, Southampton, accidentally made the important discovery that the paper prepared with the bi-chromate of potash and gum only, as described in the work on Photozincography lately published by Messrs. Longman and Co., will, if only kept for a week or ten days in the dark, yield half tones, and consequently give us lithographic or zincographic prints from any photograph.

Mr. W. Riddle writes to ask how it is that the Mersey Company's breech-loader, which fires 19 times a minute, is ignored.

ECONOMISING FUEL IN IRON-PLATED SHIPS OF WAR.*

BY EDW. ELLIS ALLEN, A.I.C.E., M.I.M.E.

THE object of this paper is to point out the very great importance of economising the consumption of fuel in iron-plated ships of war, and to show how this may best be done. It is a subject which has been sadly neglected, notwithstanding these vessels have to be constructed to carry several hundred tons additional weight, even when only partially protected.

This increase of weight has been met to some extent by reducing the number of days' fuel carried; so that instead of these vessels coaling for fourteen days, which, in the opinion of most persons, is the least they should do, the quantity has been reduced to considerably less than one-half. With bad or indifferent coal this time would be reduced to perhaps four days consumption when full steaming, *i.e.*, when the engines are working up to say four times their nominal power. Moreover, the high rate of speed considered desirable for these vessels necessitates a corresponding increase in the power of the machinery, which of course, under any circumstances, involves an increase in the fuel consumed, or, in other words, reduces the time during which a given quantity of fuel will last.

Further, it is highly probable in future wars great despatch will be necessary in moving vessels from one station to another, not only from the fact that for many years to come there will be comparatively few iron-cased vessels in the navy, but also from the increased rapidity with which warlike preparations must be made. This also will tend to increase the quantity of fuel consumed.

Even in time of peace it will be difficult to reconcile ourselves to war steamers going far under sail alone; and when the whole of the working expenses of a large ship of war are taken into account, it may be the more economical course to put her in commission so many weeks later, and then let her steam to her destination. Indeed it cannot be doubted that the same causes which have operated in supplanting sailing vessels by steamers will also induce the use of the steam power more and more as time advances.

There are thus several important reasons why every effort should be made to economise the consumption of fuel in the ships of our new iron-plated fleet, viz.:—Additional weights, increase of speed and distance to be steamed, increased despatch in moving from station to station and of time during which steam power will probably be used, even under ordinary circumstances, and increase in the cost of coals, owing to the continually increasing size, power, and number of steam ships in the Royal Navy.

To these reasons for economising fuel we may add: The universal deficiency of boiler power in ships of the Royal Navy, necessitating a relative increase of space being allowed for this portion of the machinery; as also the fact, now generally admitted, that much smaller vessels than those first constructed will be necessary in order to constitute an efficient fleet; these small vessels being of course as thickly plated as the very largest, if not more so, on account of their speed being considerably less.

From the particulars given in the accompanying table, it may be stated with sufficient accuracy that in most of our iron-plated ships the weights of the three items, viz., the armour-plating, the machinery, and the fuel, are very nearly equal, and that together they constitute about one-third of the total displacement, *i.e.*, in vessels plated amidships only. Marine engines, of good construction, when working full power, exert a force when measured by indicator, considerably above their nominal power; and it is a rule with the Admiralty that all engines supplied to them shall work up to at least four times this nominal power. Now the average consumption of fuel in marine engines of the ordinary but best construction being about 4½lb. per indicated horse-power per

Table of all Iron-Cased Ships and Floating Batteries Building or Afloat, with Assumed Weights of their Armour Plating, and Quantity of Coals Carried; the latter Deduced from Difference of Draught with or without Coals:—

—	Afloat, or building, &c.	Iron or Wood.	Wholly or partially cased.	Length.	Beam.	Mean draught ready for service.	Diff. without coals.	Tonnage	Nominal H.P.	Assumed weight of coals carried.	Assumed weight of armour plates.
				ft. in.	ft. in.						
Agincourt	Building	Iron	partially	400 0	59 3½	25 8	1 7	6,621	1,350	1,000	850
Minotaur	"	"	"	"	"	"	"	"	"	"	"
Northumberlnd	"	"	"	"	"	"	"	"	"	"	"
Achilles	"	"	"	380 0	58 3½	26 3½	1 10½	6,079	1,250	"	800
Black Prince ...	Afloat	"	"	380 2	58 4	25 11	1 8	6,109	"	950	"
Warrior	"	"	"	"	"	"	"	"	"	"	"
Hector	Building	"	"	280 0	56 3	24 8	1 0½	4,063	800	450	450
Valiant	"	"	"	"	"	"	"	"	"	"	"
Defence	Afloat	"	"	"	54 2	24 11	1 4	3,720	600	550	"
Resistance	"	"	"	"	54 1			3,710	"	"	"
Caledonia	Building	Wood	wholly	273 0	58 5	25 10½	1 6½	4,045	1,000	650	950
Ocean	"	"	"	"	"	"	"	"	"	"	"
Prince Consort	Afloat	"	"	"	"	25 11½	1 7½	"	"	"	"
Royal Alfred ...	Building	"	"	"	"	25 10½	1 6½	"	800	"	"
Royal Oak	"	"	"	"	"	"	"	"	"	"	"
Royal Sovereign	Converting	"	"	240 7	62 0½	22 11	1 5	3,963	"	550	750
Prince Albert...	Building	Iron	"	240 0	48 0	20 0	1 9	2,529	500	230	"
Favourite.........	"	Wood	"	225 0	46 9	20 5	1 4½	2,186	400	400	
Enterprise	"	"	partially	180 0	36 0	14 7½	1 7½	990	160	100	
Erebus	Afloat	Iron	wholly	186 8½	48 6	8 9	1 3¼	1,954	200	80	
Terror	" Floating Batteries	"	"	186 3	48 8	"	"	1,971	"	"	
Thunderbolt ...	"	"	"	186 11	48 5¾	"	"	1,973	"	"	
Ætna	"	Wood	"	186 0	43 11	8 2	1 3	1,588	"	300	
Glatton	"	"	"	172 8	45 2½	8 9	1 3	1,535	150	60	
Thunder	"	"	"	172 6	43 11	8 11	1 4	1,469	"	80	
Trusty	"	"	"	173 6¼	45 1¾	8 8	1 3	1,539	"	60	

hour, it follows that a nominal horse-power requires about 4 cwt. of best coals in the day of twenty-four hours, so that a 1,000-horse power engine would consume something like 200 tons of coal per day when working full power. Comparing this quantity with that for which stowage is given in the iron-plated ships of the Royal Navy, it will be seen that the best of them carry no more coal than would serve them for about four days' full steaming.

We are, nevertheless, told that in all or nearly all cases, seven days' supply is provided, but this can only be on the supposition that the engines are not intended to work full power the whole of the time; indeed, with the ordinary boilers used on board war steamers, this is not possible, for it is well known that full steam cannot be kept for more than twenty-four hours together.

The very great increase of power necessary to propel any given vessel at an increased speed renders it a matter of some difficulty to obtain a rate of speed in the iron-cased ships such as that believed to be desirable, or rather necessary, by those competent to judge. If a certain power be necessary to drive any given vessel of good form at ten knots per hour, then to increase the speed of the same vessel to twelve knots will require nearly double that power; to increase it to fourteen knots the power must be nearly three times as great, and to increase it to sixteen knots the power will require to be more than quadrupled. The estimated speeds of our new ships of war, even in smooth water, are considerably less than those thought necessary *at sea* by naval men and many others, and the difference is as much as one and a half to two knots per hour.

Six of the largest vessels are estimated to attain about fourteen knots perhour; five of them about twelve knots; two of them about eleven and three-quarter knots per hour; four of them about eleven knots; one about ten and three-quarter knots; and one only nine and a half knots; and in the vessels tried even these speeds have not been attained; whereas fifteen knots per hour has been very generally assigned as the speed below which our new iron-plated ships of war should not be propelled when at sea.

In favour of such a speed we have the opinions of Mr. Scott Russell, Mr. Samuda, Captain Halstead, Commander Oldmixon, Admiral Moorsom, and many others.

With regard to the distance which such vessels should be able to go without recoaling, we have the most distinctly-expressed opinion of Mr. Scott Russell and Captain Halstead, as well as those who have commented upon their views, that 5,000 miles should be the minimum, whereas none of our ships could, with their ordinary supply of coal, go one-third of that distance.

With respect to the increased cost of coaling the ships of the Royal Navy, it will be found that the charge on this head is now over £300,000 per annum, and in war time more than double the ordinary amount is expended. What shall it be, even in times of peace, when a fleet of iron-cased ships of the "Warrior" class shall have been formed? We may indeed view with some alarm the amount of this item in the naval estimates of future years, unless something be done to diminish the consumption of fuel in marine engines.

Regarding the necessity of economising fuel in ships of war, on account of the insufficiency of boiler power at present allowed, it will be only necessary to quote the opinion of the present Surveyor of the Navy, expressed by him when in charge of the steam reserve at Portsmouth in 1858. He says:—"As far as my experience goes, no ship of any class or with any makers' engines has sufficient boiler space; there is not one of the multitudes I have tried that has steam enough to keep the throttle valve open for two hours. The steam drops directly the vessel goes over nine knots, and this not in one or two, but in all without exception. . . . Nothing is so wasteful of fuel as too small a boiler: intense firing and incomplete combustion of the fuel is the inevitable result of trying to keep up steam in such a case. . . . Not a step is made in the right direction of obtaining speed and economy until more attention is paid to the proper proportion between the quantity of steam used in the cylinders at each stroke, and the quantity remaining in the boiler."

He says that 600-horse boilers should be used where 450-horse power boilers are now employed, and the ships would go faster, not perhaps rush past the measured mile quicker, but in a chase of four or five hours.

The Committee on Marine Engines, reporting upon this and other evidence, observe:—"From the evidence taken by the committee it appears that in general the boilers supplied to our men of war are deficient in generating steam, and that full speed in consequence can only be maintained for a short time. Now, the remedy of that defect must necessarily involve the whole question of the amount of space that can be allotted to the boilers; the committee, therefore, consider that they need not enter into further details, and that they do their duty by simply, and without comment, bringing the question before their Lordships."

Of the last reason named for encouraging economy of fuel, no better illustration can be given

* Read before the British Association, Section G, August, 1862.

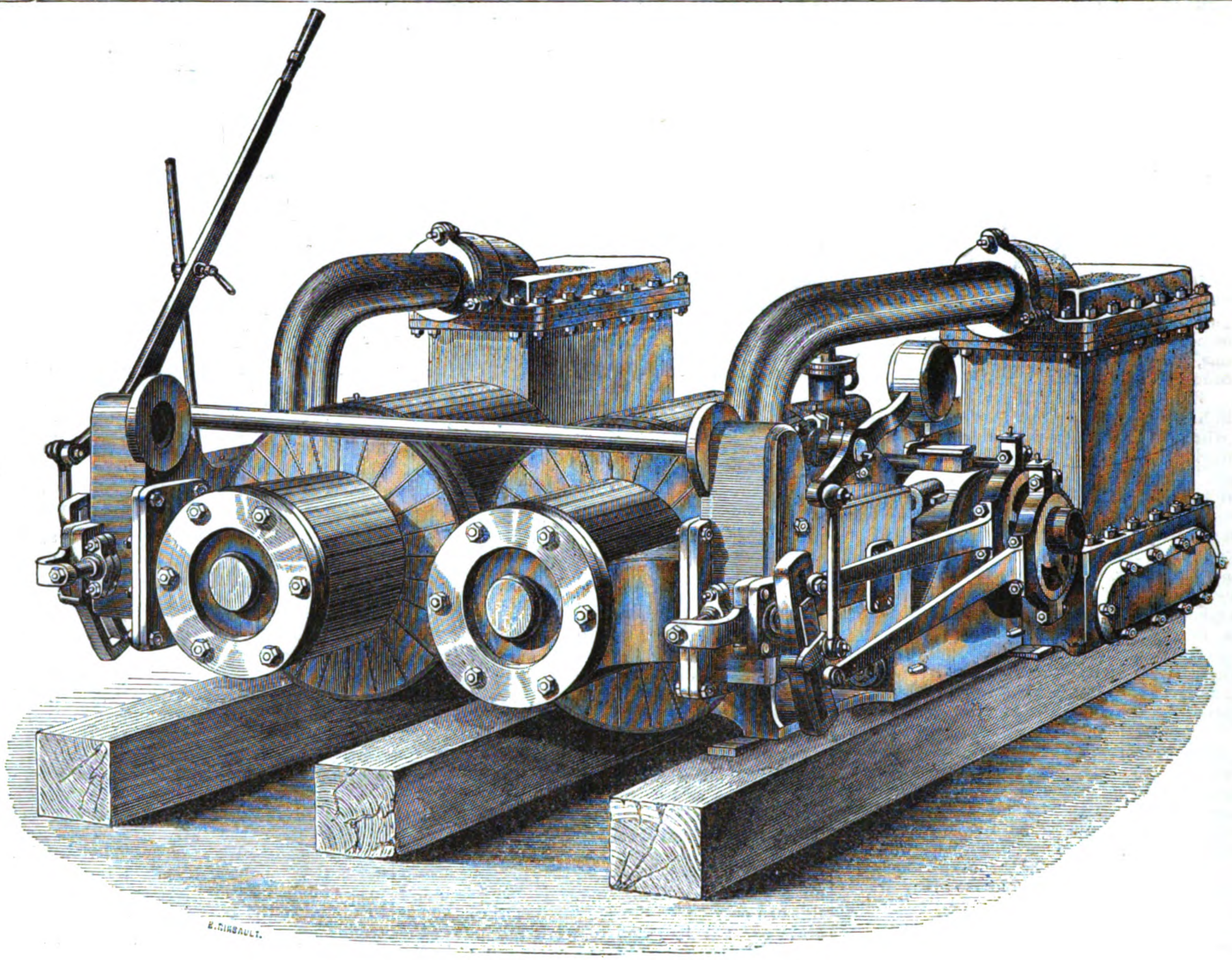


FIG. 1.

than that of the "Enterprise," the first small ship in course of construction by the Admiralty plated with armour. In this case the employment of ordinary machinery (excepting having surface condensers), not only necessitates the quantity of fuel taken being reduced to a very few days' steaming, but the speed with which we are to be satisfied is an "estimated" one of nine and a half knots only. What will this be as an average at sea? Possibly not over eight knots.

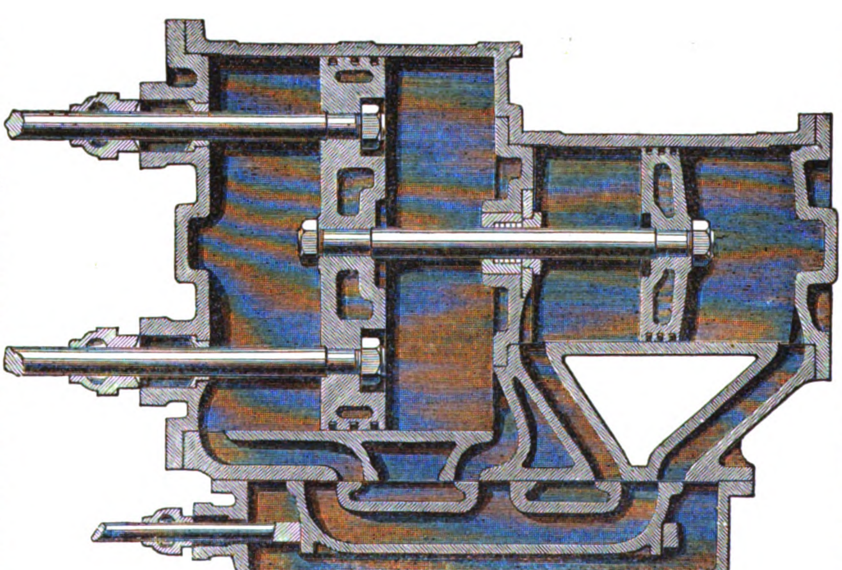


FIG. 3.

Enough has now been said to show that economizing the consumption of fuel in iron-plated ships of war is a subject of the very gravest importance; and although this will be admitted generally, and, perhaps by none more readily than the authorities of the Admiralty, it appears practically to have received far less attention than it deserves. It is hardly saying too much when we state that coal is the only item in which weight can be saved.

It has been long known that many vessels in the merchant service have been working now for some years upon just one-half of the fuel consumed in ships of the Royal Navy. In proof of this, although evidence is abundant, I shall give simply the opinion of Mr. Charles Atherton, late Chief Engineer of Woolwich Dockyard, and that of Mr. Andrew Murray, Surveyor to the Board of Trade. Mr. Atherton, in a paper read at the British Association, three years ago, says, "I believe the ordinary consumption of fuel in steam ships of the Royal Navy is fully 50 per cent in excess of the amount of 2½ lb. which has been practically realised on continuous sea service."

Mr. Murray, in his paper on "Means and Appliances for Economizing Fuel in Steam Ships" (read in March, 1860,) says: "It is hoped and believed that the day is not far distant when the average consumption of marine engines will be reduced to nearly one-half of what it now is. In Cornwall, ninety millions of pounds raised one foot high in an hour by a bushel (or 94lb.) of coal is considered fair work for a good steam engine, which corresponds to nearly 2¼ lb. of coal burnt per indicated horse power per hour. It is not likely that this degree of economy can ever be permanently maintained *at sea;* but if our marine engines can be induced to content themselves with 3 lb. or even 3½ lb., this will still be a vast improvement on their present average consumption." What this is he states in his work on "Steam Ships" in these words:—"The more usual consumption of modern marine engines varies from 4 lb. to 5 lb. per indicated horse power per hour, and the average consumption of all classes cannot be less than 6 lb.

It may be here observed that the Admiralty returns contain no statement of the consumption of fuel of ships of the Royal Navy; but this omission having been complained of for many

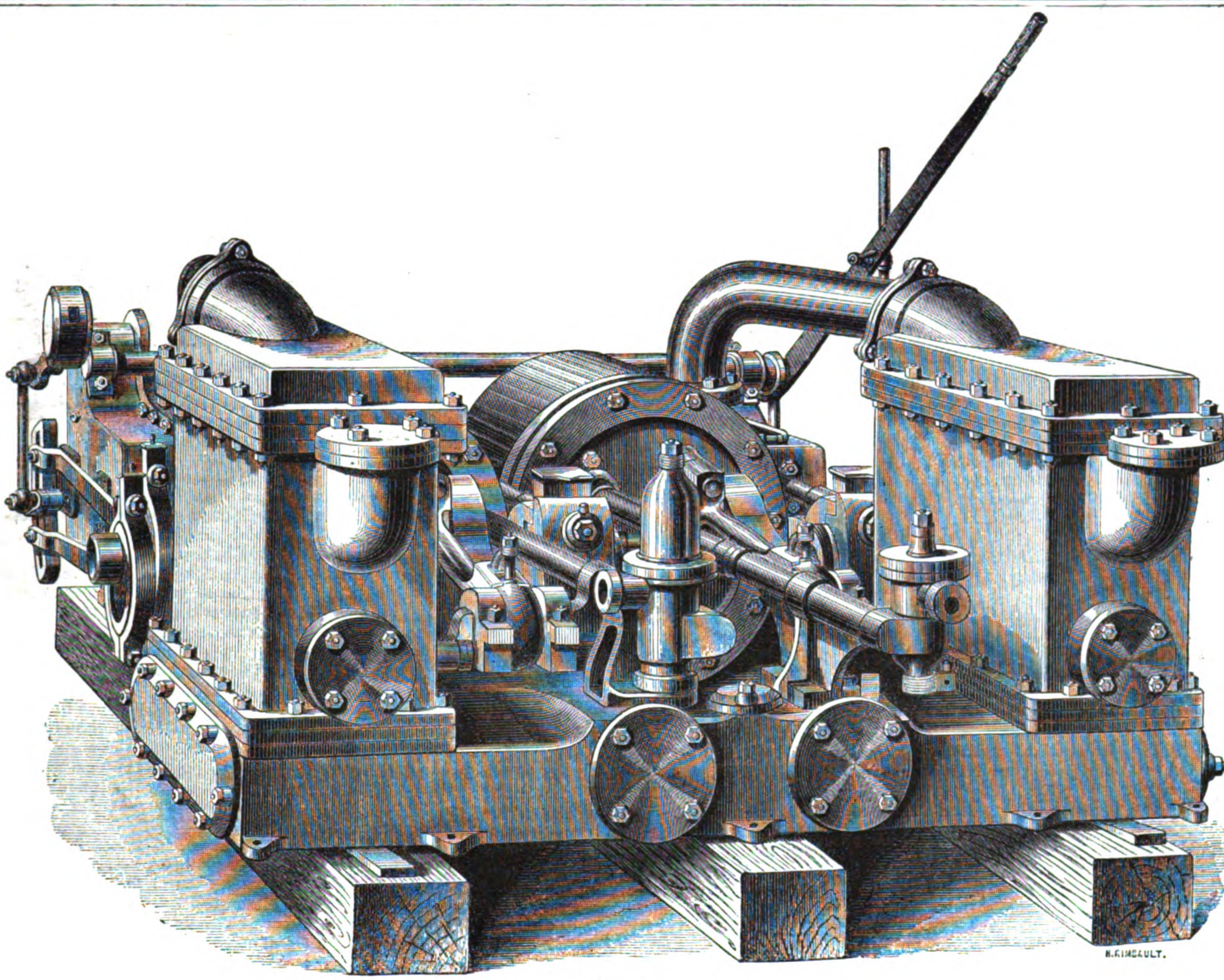


FIG. 2.

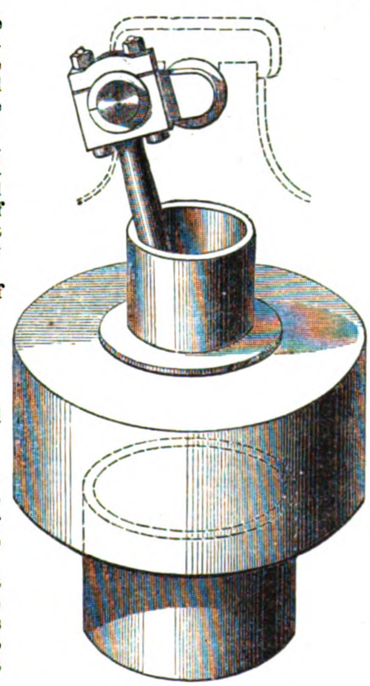


FIG. 4.

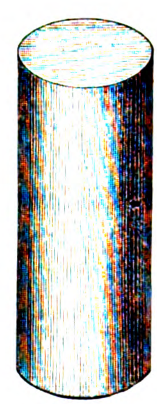


FIG. 5.

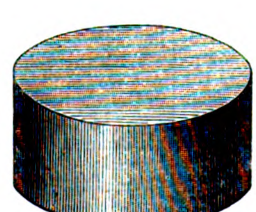


FIG. 6.

years past, the Committee on Marine Engines recommended that the consumption of coal per indicated horse power, as well as the quality of coal and evaporation of water, should be given in future.

The fact of vessels running continuously on half the fuel consumed in Government vessels is now well known, as are also the principles of construction on which this important saving is made. They may shortly be stated as follows:—

1st. Proportionate increase of boiler power.
2nd. Expansion of the steam to, say 5 lb. pressure.
3rd. Jacketing the cylinders.
4th. Superheating the steam.
5th. Condensing by surface instead of by jet; and
6th. Heating the feed water.

And all this may be done without increasing the pressure of steam above 20 lb. or 25 lb., although the higher the pressure of steam, the greater the economy of fuel.

It is difficult to assign the exact proportionate value of each of these six modes of economising fuel, as they have seldom, if ever, been so far separated as to admit of correct deductions; but, taken altogether, there is now no doubt that *fifty per cent.* may be saved in the ordinary consumption of fuel. This saving has been practically effected in several vessels where the principles above stated have been carried out.

In the early part of 1855 I read two papers at Birmingham on "The Commercial Economy of Expanding Steam in Marine Engines," and described several new forms of engines suited to this purpose, and, ever since that time, have endeavoured to direct the attention of steam-ship companies and owners, as well as that of the Admiralty, to the subject.

In 1858 I sent detailed drawings of engines to the Admiralty, the designs being made with a view to effect a very large saving in fuel. One of these was that of concentric cylinders, with three piston rods and cross head, the two outer rods being carried to a guide block, from which the connecting rod was returned to the crank; this arrangement being precisely that adopted in the Swedish gunboats, and for which a medal has been awarded to the maker in the Exhibition.

In the early part of the present year I again addressed the Admiralty, calling their attention to this subject, and requesting the favour of an examination of the engines constructed on my patent of 1855, by Messrs. J. and G. Rennie, and which may be described as double expansive end-to-end cylinders, the small cylinder being placed at the back of the large one, motion being communicated to the crank by means of double piston rods (Figs. 1, 2, and 3.) Even this arrangement has, it appears, been recently tried on one of the Swedish vessels of war, the results of working being, it is said, very satisfactory. If, therefore, the Swedish engineers have not the faculty for designing economical marine engines, they may, at least, take credit for duly appreciating what others do, and in this respect are considerably in advance of some of

the engineers of our own country. In these several applications to the Government, the object was to show how the expansive principle could, in my opinion, be best carried out in ships of war, fulfilling the necessary conditions of such vessels, *i.e.*, of keeping the weights down as much as possible and the machinery below the water level.

I showed, in my papers, that the suggested alterations in marine engines could be made without either adding to the gross weights carried or to the space occupied in the ships, and that a very considerable saving of coal would be the result; increased capacity of cylinder to allow of full expansion of the steam being, of course, under every possible arrangement absolutely necessary.

One of the forms of marine engines suggested by me in 1855 has lately been adopted in the case of the Poonah's engines, now building by Messrs. Humphreys and Tennant, the small and large cylinders being placed end to end, as above described, with reference to the engines made by Messrs. Rennie, but motion being given to the crank shaft by means of a trunk working in the large cylinder. (Fig. 4.)

For these several form of double expansive engines may be claimed many advantages, which are shortly these:—

1st. Capability of fully expanding the steam without the use of expansion gear.

2ndly. Great uniformity of motion by reason of the steam from the boiler acting upon a comparatively small area, not pressing upon the large pistons until partially expanded.

3rdly. Saving of considerable weight on account of the strength of the connecting rods, piston rods, &c., being only necessarily proportioned to the pressure of the initial steam on the small piston and the expanded steam on the large area; instead of the initial steam on the latter; or, rather upon a considerable extension of it, as in the case of a single acting cylinder designed for great expansion, its area must be greatly increased, the stroke not being capable of being lengthened.

4thly. Considerable saving of steam owing to the loss in clearances in the small cylinder being made less than that in a very large cylinder, the loss in the latter case absorbing a large percentage of the steam.

5thly. The cylinders being in line with each other no increase in the number of piston rods, connecting rods, or guides are necessary.

6thly. That, practically, all the advantages of a long-stroked engine are obtained without increasing the stroke, and which cannot be done owing to the speed of revolution of direct acting screw engines being necessarily high.

And 7thly. That by fully expanding the steam, a far less quantity suffices for the production of a given power, this allowing of the boilers being reduced a third or a fourth, still leaving a large proportionate increase in boiler power compared with the steam required.

It will be readily admitted, on all hands, that very considerable difficulties would be found in making ordinary marine engines fully expand their steam, an increase in the capacity of the cylinder of from two to three times being essential.

At present the shape of the cylinders of marine engines approaches to that of those of rivetting machines, their diameter being frequently 2½ times the stroke; whereas in pumping engines, in which economy is studied, the cylinders assume an entirely different form, their lengths being three times their diameter, as shown in figs. 5 and 6, which represent cylinders of the same capacity, the former similar in shape to those of the 1,350 H.P. engines constructing for the largest iron-plated ships, and the latter the cylinder of an ordinarp pumping engine. Indeed all engineers admit that, in very short cylinders, *i.e.*, single-acting ones, economy is out of the question. It is, therefore, greatly to be regretted that, in our iron-plated ships, even in those of the largest class, the same form of engines has been adopted as was employed fourteen years ago, notwithstanding Mr. Atherton, the late engineer at Woolwich Dockyard, recommended some years ago that "double expansive engines ought to be tried," especially as superheating of the steam had been carried out.

Mr. Murray has rather severely remarked upon "the plan adopted by the Government of contracting for their steam machinery with only a few favoured and old-established houses," and states that this, "though perhaps justifiable in other respects, has undoubtedly tended to promote conservatism in marine engines, and to repress innovations and improvements. . . . . competition being scarcely roused into action. . . . . . In the case of those manufactures, ... however, who are dependent upon the custom of the great steam shipping companies, and other private owners of steam-vessels, who have a strong interest in this question, there exists an active competition, and, consequently, a powerful inducement to improve upon the economical performance of their machinery. We find, accordingly, that it is this class who have taken the lead in the steam reformation which has recently set in."

The practicability of saving so great a percentage of fuel being now so well known, how is it that the whole of our iron-cased fleet at present in existence or ordered, are doomed to consume double the amount of fuel which is necessary?

In the twenty-six iron-cased ships constructed and constructing, a force of no less than 18,310 nominal horses power is to be employed; and when working full power, *every day* will witness an unnecessary consumption of upwards of 1,700 tons of coals, which, on foreign stations, would certainly amount to more than £5,000 sterling.

This loss is, however, not what is to be most regretted; but rather the fact that our iron-cased fleet, the largest vessels of which are to cost upwards of £350,000 each, and are provisioned for four months, should only carry coals enough for from four to five days' steaming. It is surely a sad pity that these vessels should have to creep into port every time after steaming, say 2,000 miles, or else waste days, and perhaps weeks, of valuable time on full commission pay, in attempting to reach their destination by the use of sails?

If it be maintained that the quantity of coals carried is sufficient—which, I think, the Admiralty authorities would hardly acknowledge—even then is it not better to increase the armour plating, or the speed of the vessels, by reducing their draught or increasing the power of the engines, rather than carry an unnecessary quantity of expensive fuel?

It is now certain that the speed of the "Warrior" and "Black Prince" is much below what was anticipated. And even if a speed of fourteen knots were obtained, under the most favourable circumstances of clean bottom, clean tubes, and fair weather, this would be reduced to about twelve knots at sea, running days together; and this is no less than three knots below the speed that has been considered necessary.

Again, if the present quantity of fuel carried be enough, the engine power could be increased some 40 per cent. without increasing the draught of water, and still allow of the same number of days' fuel. This increase of power would increase the speed about one knot and a half per hour, which cannot be regarded as a matter of slight importance.

With these facts before us, the question arises, Are we justified in continuing to employ engines of the ordinary kind in our iron-plated ships of war? In considering this matter we must be careful not to confound the excellency of workmanship of Government engines, which is all that can be desired, with correctness in the principles upon which such machinery is made and worked.

The wasteful expenditure of fuel in all vessels having ordinary but first-class machinery, arises, of course, from the principles upon which it is made and worked being faulty; such as filling the cylinders three parts or seven-eighths full of steam, and only expanding in the remaining space; condensing by jet; not super-heating the steam or heating the feed water; confining the boiler space in proportion to the steam used (although this space is much greater than required under improved conditions); not jacketing the cylinders; and, finally, using short-stroked single expansive engines.

No amount of excellence in workmanship can ever make up for this total disregard of every principle which experience has shown to be necessary to economical working.

Our present navy consists of vessels in which there is a nominal power of upwards of 142,000 horses, distributed in about the following proportions:—

	Horse-power.
Ships in commission	60,000
Do. in ordinary	51,000
Do. used as transports, &c.	13,000
Do. (new iron-plated) and batteries	18,000
Total	142,000

The ultimate extent of our iron-cased fleet, of course, is not as yet known, but taking the very moderate estimate made by Mr. Scott Russell, we have yet engines to provide to the extent of, at least, 60,000-horse power, making a gross power of 200,000 horses.

Assuming that one-half of these vessels are in commission in time of peace, the *daily* consumption of coal when working full steam would be over 15,000 tons at the present rate per indicated horse power.

Now ships in commission may be fairly assumed to be one-third of their time under steam, say two days per week, or 100 days in the year. They will probably be half this time under easy steaming, and the remainder three-quarters and full steaming, and will consume from 2½ to 3 cwt. of coal per day, or 14 tons per annum per nominal horse power, or for the whole of the ships in commission about 1,400,000 tons per annum.

This is, then, what we may look forward to in the navy returns in future years of peace, *i.e.*, if the present consumption of fuel be maintained. It is just half this quantity, which experience has now fully proved, may be saved by a modification in the mode of constructing and working marine engines, and it is to the cost of this quantity, which could be saved, and the advantages arising from its absence in the vessels, that attention is now invited.

Applying the same calculations to the engines of the twenty-six iron-cased vessels made or ordered, or omitting the floating batteries and some of the vessels in ordinary, it appears more than probable that had these vessels been fitted with improved machinery, a *money* yearly saving would have been made sufficient to purchase at least one iron-cased vessel annually, from saving in the consumption of coal. This again, it must be remembered, is quite distinct from the other numerous advantages which have been referred to, and of which no estimate can be made; the very existence of the ships being perhaps jeopardised by either want of coal or want of speed.

This saving of fuel, whenever brought about, will, without question, give us one or other of the following advantages, *in addition to the money saving*, viz.:—

Increase of armour plating, 50 per cent.; or,
Increase of speed to the extent of one knot and a half; or,
Increase of number of days' fuel to double what it now is; or,
Diminished draught to the extent of 8 in. to 12 in., according to the vessel,

thus enabling us to have armour-plated vessels of comparatively very small tonnage.

To all this we must not forget to add the loss of time, expense, and inconvenience of frequent coaling when only five to six days' supply are carried; and, again, the cost and labour of trimming the coals, and feeding the furnaces with double the quantity which would be needed with good double expansive engines.

It is hoped that these considerations will induce the Lords of the Admiralty to turn their attention to the advantages of working steam expansively in the vessels of the Royal Navy, not simply as it has hitherto been done,

and when the power is proportionately diminished and no saving effected, owing to the machinery not being adapted for expansive working, but constantly and regularly in ordinary working and under proper conditions, when its advantages would be at once experienced.

In conclusion, it is only fair to mention that soon after the appearance of the report of the Committee on Marine Engines, recommending that the number of contractors for Government engines should be increased, and that the best engines should be adopted in ships of the Royal Navy, by whomsoever proposed to be supplied, orders were issued for three pairs of engines, designed to work with less fuel than usual. Messrs. John Penn and Son supplied a pair of large trunk engines, with surface condensers; Messrs. Maudslay a three-cylindered arrangement, also with surface condensers, designed by Mr. Sells; and Messrs. Randolph and Elder a six-cylindered arrangement, also with surface condensers.

Neither of these vessels have as yet been fully tried, the results, however, being anxiously looked for by engineers.

Considering the nature of these three plans, which, with the exception of the trunk engines, involve considerable complexity, the trunk and three-cylinder arrangements being, moreover, single expansive engines, it is very doubtful if the results can be altogether satisfactory; and certainly cannot be so far so as to warrant experiments stopping at the point at which they have now arrived. Trials should at least be given of such other arrangements as appear likely to give favourable results.

The double-expansion end-to-end cylinder engines proposed by me in 1855, for ships of war, having now been very ably worked out by Messrs. J. and G. Rennie, and, it is understood, been favourably reported upon by the inspecting engineer of the Admiralty, who was instructed to examine them. It is hoped an opportunity will shortly be afforded of testing their suitability for her Majesty's ships; the success of the principle of double expansion being already fully established, and Messrs. Rennie being prepared to guarantee to the Government that the consumption of fuel shall not exceed 2 to $2\frac{1}{4}$ lb. per indicated horse power per hour, or half the ordinary consumption. To the general introduction, however, of so radical a change in the construction of marine engines for the ships of the Royal Navy, a thorough conviction of the importance of economising the fuel seems essential, and it is hoped this will be found to have been somewhat promoted by the present paper.

ANTI-FOULING OF SHIPS.

SINCE 1845, says the *Times*, when experiments with protecting and anti-fouling compositions for the bottom of iron ships commenced at Blackwall, on Her Majesty's screw yatch "Fairy," with the compositions of Baron Wetterstedt, Mr. Owen, and Mr. Ditchburn, up to the present time, when the preparations of Mr. Hay, M'Innes, and Peacock, and Buchans, are those exclusively applied to sea-going vessels in her Majesty's navy, not one has been found to answer in all the necessary requirements. Many of the compositions tried have not only failed to prevent the adhesion of foreign matter to an iron ship's bottom, but have actually, or apparently, assisted the formation and growth on it of marine incrustations. The composition prepared by the Admiralty chemist, the chief ingredient of which is oxide of copper, and which, according to the official reports from Malta and the home dockyards, stands first on the list for its preservative and anti-fouling properties, does not altogether prevent the growth of weeds or the attachment of shells to the bottom of a vessel on service in a tropical climate. For the new patent composition of Mr. Hay, he claims a great superiority in anti-fouling properties over the ordinary composition in use, but this has not yet been tested fully on the bottom of any sea-going vessel. As the "Himalaya," which is coated with Peacock's and Buchan's composition, will be again placed in the dock adjoining that in which the "Megæra" is, an opportunity will then exist for comparing the three compositions. The serious damage which has been inflicted upon the bottoms of iron ships coated with anti-fouling compositions, when on lengthened foreign service, by the destruction of the composition and subsequent corrosion of the plates and rivet-heads, together with the necessity for meeting the threatened want of increased dock accommodation for our iron ships as speedily and effectively as possible, has induced the Admiralty to devote their immediate endeavours to find some means to render this docking of iron ships for cleaning and re-coating their bottoms as seldom requisite as possible. Mr. Griffiths has laid before the Admiralty a plan for sheathing the bottoms of iron ships with Muntz metal, using a non-ducting material between the protecting metal and the iron-bottom plates, and has received an order to sheath a small iron vessel on this plan as an experiment. The Controller of the Admiralty has also called upon Mr. Hay, chemist to the Board, to send in to the Admiralty a model of his proposed plan for sheathing the bottoms of iron vessels with copper or Muntz metal. This plan was first submitted to the notice of the Admiralty on the annual visit of the Board, with Lord Auckland at his head, some years since, and was discussed by the Board on their return to London, but its adoption was declined. The decision had just then been arrived at that iron ships were quite useless as men of war or Government screw troopships, and that it was even desirable to get rid of the very few that then were on the navy list. Other plans besides those of Mr. Hay and Mr. Griffiths are also before the Admiralty, all seeking to attain the same end, although by different means, several resorting to the process of electrotyping in preference to either applying temporary compositions, or the ordinary method of protecting wooden ships by sheets of copper. The two more prominent of these last are known as the "Besley" and "Walen" processes. Both profess to deposit a pure metal, or a combination of metals, by an alkaline process in lieu of the old acid process. The Besley process is already partially adopted by the Admiralty at Portsmouth, tanks and batteries now being at work over the steam factory of Portsmouth Dockyard, depositing a coating of metal on the iron bolts that are to be used for fastening the armour plates on the sides of the "Royal Alfred" and "Royal Sovereign." The success as yet has not been great; in fact the alkaline process as developed by the Besley system is, owing to some cause, slow, and may possibly yet be superseded by the original acid bath. The Walen alkaline process is represented by the floating dock in the Victoria Docks, and its effectual success there seems to be placed beyond a doubt. Mr. Walen claims, as the merits of his invention, that he can rapidly precipitate a pure metal, or a combination of metals, upon iron of any uneven form, with a perfectly even and bright surface, of any thickness, and indestructible as the metal upon which it is deposited. Mr. Walen, while proposing very much that is evidently simple and practicable, and which will doubtless be carried out with but little delay, relative to the preservation of our iron ships in their construction, goes much further than this, and advocates the adaptation of one of the new docks now constructing as a hugh bath, in which an iron ship, when delivered to Government by the contractors, might be at once received, and coated as far above the water line as required, by one process, with an imperishable covering of copper or other protective metal. Whether all or any of these plans should be definitively adopted by the Admiralty time and experience can alone decide.

EXPERIMENTS WITH ARMSTRONG AND WHITWORTH FIELD GUNS.

(From the Daily News.)

SOME very interesting trials of 12-pounder field-guns, rifled according to the different systems of Sir William Armstrong and Mr. Whitworth, were made at Fort Twiss, near Shorncliffe, last week, before General Bloomfield, inspector-general of artillery, and a large staff of officers. The Whitworth guns were four in number, and formed part of a battery of 12-pounder brass muzzle-loading guns, being the first guns rifled on this system which have been furnished for the service. The Armstrong guns were two of the ordinary 12-pounder field-guns, such as were used in China, with certain improvements since adopted, and of course breech-loaders, made of iron on the plan employed in the construction of all the Armstrong guns.

This was the first occasion on which so direct a comparison has been made between these rival systems in regard to field-guns, and the result was regarded as one of considerable importance by the officers of Artillery and other scientific artillerists present at the experiment. The trials began by firing at a floating target distant 500 yards. As the shot fell in the sea no very close comparison could be made as to the accuracy of the respective hits, but both at the 500 yards range and afterwards at the 1,200 yards, the shot from the Whitworth was the first to carry away the flag aimed at, and it was generally conceded that at both ranges this gun fired closer to the mark than the Armstrong. Both guns were then tried with shell, the Armstrong firing the compound percussion shells, the Whitworth firing the new kind of shrapnel perfected under the superintendence of Colonel Boxer, who has been permitted to give all the assistance his great knowledge and experience afforded in advancing Mr. Whitworth as to the construction of this new projectile, which is now promising so far to suppass all shells hitherto invented, whether for the field or for piercing the sides of armour-plated ships. It was observed that considerable number of the Amstrong shells burst in the air before reaching the mark, and of course without effect; but the Whitworth shell, being used with a time-fuse, which is ignited in front like the old shell by means of the ordinary Boxer time-fuse, was found to be more regular and effective in its action. The complicated apparatus contained in the Armstrong shell for obtaining ignition by percussion is dispensed with, and consequently the projectile is a much cheaper, and what is more important, a more certain weapon. The mode in which the new shrapnel acts is, that at the required moment, ascertained precicely by knowing the distance of the object, the shell bursts by the burning out the fuse, the charge of bullets is dispersed. The end or front of the shell is blown off, and from 40 to 50 bullets and pieces of iron, all of a size large enough to be highly destructive, are scattered in every direction. When this shell is fired at long ranges, as it would be on entering into action, the iron case is not completely broken up, and the larger portion acts as a solid shot, continuing in its course, or, perhaps, smashing a gun carriage, or striking the gun so as to disable it. The Armstrong shell is burst on striking the object into as many as 217 fragments, all small, and many of very small size. So that if it were partially buried in striking the ground much of its destructive power would be thrown away. If the new shrapnel shell is required to be used at short range the case is easily burst completely by increasing the bursting charge of powder. A few of them on this occasion burst short of the mark, but on the whole the practice was considered to be very good, and entirely confirming the anticipations of the inventor, Mr. Whitworth. But perhaps the most interesting part of the experiments was a comparison made between the two different kinds of ordnance as to rapidity of fire. It has always been held that the one great advantage of the breech-loader was its superiority in handiness and quick firing. The result of this trial does not, however, confirm this opinion. The artillery-men were ordered to fire twenty round shots from each gun as rapidly as they could be served. The Whitworth gun finished the twenty rounds first, completing the task in thirteen minutes: the Armstrong followed $2\frac{1}{4}$ minutes later. This superiority was attributed to the simplicity of the

loading and serving the Whitworth gun, the drill being, in fact, precisely the same as in working one of the old smooth-bore guns, whereas the Armstrong drill requires three or four extra movements. All the guns were further tried by firing from each 100 consecutive rounds. The Armstrongs were fired with lubricating wads, and were also washed out and had their breech pieces changed as often as they became heated so as to be unsafe; the Whitworths all completed their 100 rounds without being washed out at all, and without using any lubricating wads. It was remarked, too, that the loading was as easy at the last round as at the first.

The trial exhibited a practical proof of the value of brass muzzle-loading guns. The French artillery, it will be remembered, have always preferred these guns, as they are found very rarely to get out of order, either by injury in service or by the action of the weather. When rifled, as these guns were, upon the Whitworth system, and made without the complicated arrangement for loading at the breech, it is evident that they are capable of the most efficient service of any field-gun yet employed.

MODE OF APPLYING THE ELECTRIC LIGHT FOR MINING PURPOSES.

By MM. DUMAS AND BENOIT.

THE apparatus consists essentially of three parts—a battery, a Ruhmkorff's coil, and a Geissler's tube—the whole arranged so as to produce a sufficient light to illuminate the miner, and allow him to work in atmospheres where other lights fail.

The light produced is cold, or rather does not heat the tube in which it is produced; and gas has no access to it: it is quite isolated. The apparatus is as compact as ordinary lamps, and there is no injurious emanation. It can be lighted or extinguished at will. It can work for twelve consecutive hours without diminution, and without requiring any change. The workman has only occasionally to agitate the carbon by means of a rod.

The greatest difficulty consisted in being able to associate a battery of such intensity that the weight of the apparatus was as small as possible, the light produced of the greatest regularity, and its duration at least twelve hours. The present form of the apparatus, which may be still further diminished, is already so small that the miner can carry it without inconvenience, like a small carpet bag.

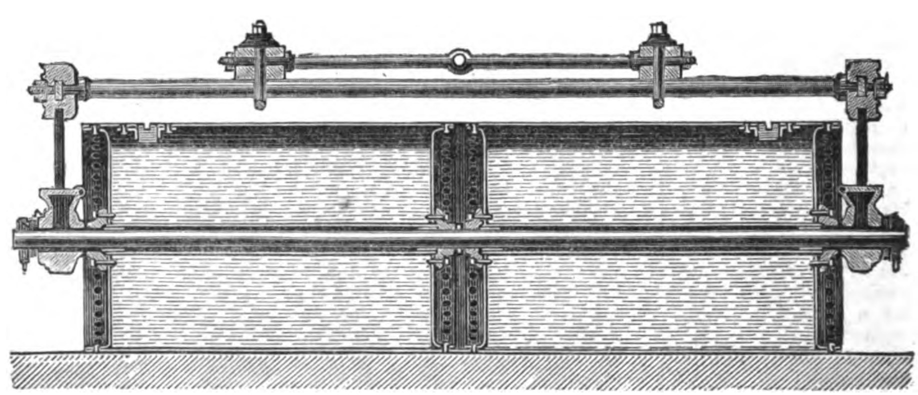
The authors point out the advantages of such a mode of illumination, and state that the results obtained in using Becquerel's fluorescence-tubes have led to the expectation that the luminous effects may be greatly improved both as to duration and intensity.—*Comptes Rendus*, September 8, 1862.

A COMPRESSING AIR PUMP.

AT the last meeting of the Manchester Philosophical Society, a paper was read by Dr. J. P. Joule, entitled, "Notice of a Compressing Air Pump." The author referred to the difficulties of realising in practice the theoretical advantages of the air, or the super-heated steam engine. The abrasion which takes place when metal rubs against metal, without an intermediate lubricator, speedily destroys the cylinder. He believed that the necessity of using elastic packing would not exist if the length of the channel along which the elastic fluid must pass, in order to arrive at the opposite side of the cylinder, were sufficiently increased. This might be accomplished by increasing the depth of the piston, or by placing on the rim of the piston concentric rings to enter, at the beginning and end of each stroke, corresponding concentric grooves in the covers of the cylinder.

The principle of great depth of piston, as a substitute for packing, had been successfully carried out in the pump which was the subject of this communication. The cylinders, two in number, are twenty inches long and two inches in diameter. The pistons are solid cylinders of

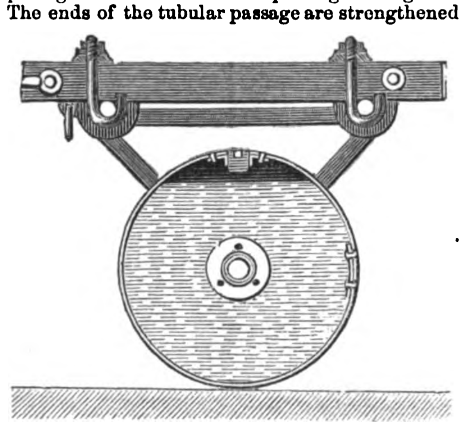
BARFORD'S IMPROVED LAND ROLLERS.



iron, ten inches long, fitting as accurately to the cylinders as is consistent with freedom of motion. The depth of each piston, as compared with its diameter, renders the usual guide or parallel motion unnecessary, so that the connecting rod is simply jointed to the top of the piston. Air is readily compressed to sixteen atmospheres, the quantity passing the sides of the cylinders being very trifling.

BARFORD'S IMPROVED LAND ROLLERS.

THE engravings represent sectional views of an improved land roller recently patented by Mr. W. Barford, implement maker, of Northampton. This invention has for its object the improvements in rollers for rolling land. For these purposes in constructing a roller (whether consisting of one or more cylinders), in order that the same may be weighted with water more advantageously than heretofore, each roller or section of a roller is closed at its ends, the ends being connected by a suitable tube or hollow passage to allow of the axle passing through it. The ends of the tubular passage are strengthened



or bushed where they receive and turn on the axle. The cylinder or cylinders used in constructing a roller may be of wrought or cast iron, and such is the case in respect to the ends or covers. These parts are put together water-tight, and such is the case in respect to the tubular or hollow passage which connects the two covers or ends of a roller or of a section of a roller. Each roller or section of a roller has an opening in it through which the supply of water is introduced, and such opening is closed by a screw plug or by other convenient instrument. By these means each roller and section of a roller consists of a vessel closed at each end, with a hollow passage through the centre thereof, whereby the supply of water introduced for adding weight thereto may rise above the axle, and even fill the roller or sections of which a roller is composed.

INCRUSTATION AND SCUM PIPES.*

THE number of boilers under inspection which suffer from incrustation is very large; indeed, to escape this inconvenience is quite exceptional. It forms a considerable impediment to satisfactory inspection, since it renders it difficult to ascertain the actual condition of the plates; it sometimes gives a delusive appearance, and leads to undue suspicion of corrosion, but more frequently it conceals defects, since corrosion is often found to be going on under, and to be caused by, the deposit.

In addition to the waste of fuel occasioned by incrustation, the wear and tear of boilers is considerably increased, apart from the effects of over-heating. Thus internally double-flued boilers suffer from the undue longitudinal expansion given to the furnace crowns, which increases the tendency to groove at the front end plate, an action always more or less developed in these boilers, while incrustation renders the use of tubular boilers altogether impracticable in localities not supplied with good water, and thus prevents the more general use of this economical class of boiler.

Although the danger of allowing incrustation to form on plates exposed to the action of the fire is too fully appreciated to need remark, the fact is not so fully recognised that even where no actual cake of deposit is formed, overheating frequently occurs. It is thought that this may, in many cases, be due to the presence of thickening matter held in suspension in the water, and it would be interesting to ascertain by experiment whether the impediment thus presented to the free escape of the steam does not—where the circulation is imperfect, or no such agitation of the boiler takes place, as in locomotives when running—lift the water off the plates, and thus cause overheating. Of the fact of overheating occurring where no incrustation is formed, and with an ample supply of water in the boiler at the time, there is no doubt, instances are constantly coming under notice, and it may be added that they are chiefly found to take place in boilers externally fired.

Apart from the injury done to the boilers from incrustation, a considerable amount of earthy matter passes over with the steam into the engines, and thus renders necessary the use of an increased amount of tallow for the piston and slides. This, though too frequently lost sight of, is illustrated by the fact that where boilers are fed from brooks, subject, on heavy rains, to sudden torrents which stir up the mud, the engine attendants are in the habit, at such times, of taking the precaution of giving the engine cylinders an extra amount of lubrication, finding the pistons, &c., to clog when this is neglected.

Under ordinary circumstances, the most practical plan for the prevention of incrustation is the adoption of an efficient mode of "blowing-out," and not the use of "boiler-compositions." To blow out, however, from one point only, at the bottom of the boiler, which is the general custom, has but a very limited and local effect. This is frequently remedied by the adoption of a perforated pipe, which is connected to the ordinary blow-out tap, and carried along the bottom of the boiler from one end to the other. These are technically termed "Topham-pipes," from the name of the patentee, and are generally spoken highly of by those of our members who have adopted them. They are, however, more successful where the sediment being heavy and sludgy falls to the bottom, rather than where it is of a lighter character, which frequently forms the hardest and most tenacious scale.

From the rapid ebullition that takes place within boilers when under steam, it is found that a greater part, if not the whole, of the sediment, set free by evaporation rises to the top of the water, forming a

* From the Monthly Report of the Manchester Association for the Prevention of Steam Boiler Explosions.

coat of scum, before finally depositing itself upon the furnace tubes or shell; and thus the readiest way of preventing incrustation is to blow out this layer of scum from the surface of the water by means of a scum pipe, before it has an opportunity of settling. There is nothing new or experimental in this, the system has been for years adopted with marine boilers, and there is no reason why its use should not become equally general with stationary ones. Many of our members have already tried it with considerable success, and find, on opening their boilers after a month or six weeks' work, that where they used formerly to be coated with a heavy muddy deposit they are now perfectly clean.

The following is an explanation of the description of pipe adopted:—It is about three or four inches in diameter, having a wing cast to it on each side, so as to form a trough throughout the entire length of the pipe. This pipe is carried within the boiler, from one end to the other, being made in any convenient lengths for introduction at the manhole; it is perforated with small holes on the top all the way along, the aggregate area of the whole number of these holes being equal to that of the pipe itself. The top of the trough is fixed a few inches below the level of the water, so that the scum on the surface may flow over it, when, being guarded from the disturbance of the ebullition, it deposits in the still water above the trough the sedimentary particles held by it in mechanical combination. A tap is fixed to the front end plate of the boiler in communication with this pipe, by means of which it can be blown out as frequently as is desired, which should not be less than once every two hours, when ebullition is going on. This tap, which need not be more than two inches in diameter, should be entirely of brass, fitted with a gland, and have a neat waste pipe attached, which may be of wrought iron, while also the waste pipes from the glass water gauges may be connected to it, being led immediately under the dead plate, which arrangement is found to be very compact and convenient. The best position for the scum pipe is at the side and not at the centre of the boiler, both on account of facility in fixing, and convenience in getting inside. A single pipe is sufficient.

The above description is not by any means given as if that were the only form of scum pipe that could be advantageously applied. It was designed for the use of the members as being adapted to stationary boilers, simple in construction, affording a large collecting area, and being free from any patent right. Upwards of a year's trial has proved it to be successful, and its more general adoption is consequently recommended. These pipes have already been made by the manufacturing engineers of Rochdale, Bolton, Bury, and other places, but are needed more generally, and a drawing at the office is open to inspection for the benefit of our members.

There are other plans in operation which, however, are subject to patent right. One of these consists of a series of vertical pipes, fixed in the centre of the boiler, each pipe having a trumpet mouth, to which a vertical telescopic movement is given, to allow for the changes of water level, the movement being effected by a copper ball float, so that the trumpet mouth rises and falls on the changes of water level, like a buoy on the rise and fall of the tide; the object being to keep the mouth of the pipe immediately below the surface of the water, in close proximity to the scum. A second plan consists of a trumpet mouth laid horizontally. Both of these arrangements are reported to give satisfaction, and, whenever opportunity offers, the results of their working will be noted, and particulars of the plan found to be most successful communicated to the members.

Some descriptions of incrustation, however, cannot entirely be removed by any blowing-out apparatus alone, however perfect; in such cases a little carbonate of soda may be added, which many of our members have applied with considerable success. Of the use of this, their experience is decidedly in favour, while the testimony with regard to complicated "boiler compositions" generally is that they found them expensive, in many cases useless, in others injurious, and have, in the majority of instances, discontinued them altogether. For fuller chemical particulars refer to Dr. Angus Smith's report to the Executive Committee upon the incrustation in boilers. The use of soda, without a scum pipe, is found in some cases to induce priming; the soda combining with the grease within the boiler, and producing foaming of the water.

The general adoption of scum pipes is, therefore, confidently recommended to the members, not only for the prevention of incrustation, but also, in order to lengthen the lives of their boilers, as well as to assist the engines in many cases, by preventing priming.

The most radical cure for the prevention of incrustation, though one involving considerably more outlay, at the first, than the above, will be found in the adoption of dry or "surface condensation," by means of which the boiler is fed with distilled water, the same being used again and again, with the exception of the slight amount lost through leakage. To those who are paying large amounts annually for a supply of town's water, and where the steam is consumed for engine purposes, the adoption of surface condensers is well worthy of serious consideration, not only on account of the saving in the water rates, but also in that of fuel, since non-condensing engines may, by this means, be converted into condensing, which is not at present generally the case where town's water is used.

L. E. Fletcher, *Chief Engineer.*

TYZARD'S IMPROVEMENTS IN THE CONSTRUCTION OF VESSELS, FORTS, &c.

In our last number but one we gave an illustrated description of a new plan for constructing vessels, forts, &c., but we omitted to state that the invention had been patented by Mr. W. L. Tyzard, engineer, of Mark-lane, who has been long known as a successful contributor to both mechanical inventions and scientific literature.

TO CORRESPONDENTS.

Received.—W. A., F. A. P., C. B. A., C. B., F. J., W. C., W. R., E. F. H., T. H. E., (the plan here suggested for copper sheathing iron vessels is similar to the one patented by Mr. Grantham) W. R., E. E. A., T. H. P., A. S., W. E., T. T. H., W. B., J. H. T., D. M. F., I. N., R. P. E.

Correspondence.

[*We do not hold ourselves responsible for the opinions of our Correspondents.*]

WATER-CASED SHIPS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Sir,—The power of water to resist a sudden impact is shown by the glancing of a cannon-ball when it strikes the sea, &c.

It occurs to me that if the sides of an iron vessel were made double, and the hollow cellular space between could be filled with water when going into action, a great amount of protection might be gained, even if actual impregnability were not secured. It is evident that one great advantage of this would be that the vessel at all other times might be light-weighted, and shells and liquid fire would be rendered less dangerous when exploding in water.

Rob Roy.

PROPULSION OF VESSELS.

Sir,—In reply to the observations and inquiry of "X. Y. Z.," in the last number of the Mechanics' Magazine, I may state that I have exhibited in action, at the Crystal Palace, models of various sizes, some of them being 4 ft. 6 in. in length, carrying 10 or 12 lbs. of cargo, and propelled at the rate of three miles an hour by a very fine jet of superheated steam, not exceeding 1-100th of an inch in diameter, in fact a mere point. Within the last few days another model of about the same size, with a little more steam, has gone between four-and-a-half and five miles an hour through still water. These results were of course obtained by boats of the shape best suited for the purpose.

With the marine engine, it is well known that increased speed may be obtained by simply increasing the length of the vessel, keeping the power in the same proportion as before. Now that my small boats go with a speed never before obtained from the same quantity of steam, a mere inspection of of the models will prove, and it, therefore, seems necessarily to follow that large vessels on the same plan will *at least* give an equally good result as from machinery. But the plan will be commercially useful if the result on a large scale should even be less. The enormous saving of space, impossibility of derangement, no outlay for costly machinery, no interference with the sailing qualities of the vessel, combined with the advantage of being able to steer her even in a heavy sea, with or without the rudder, will surely be an ample compensation for some diminution of speed, which really means nothing more than a slight increase of fuel.

I am, Sir, &c.,
Jas. Parker.

Claremont Cottage, Lilford-road, Camberwell.

Sir,—Seeing an article in your number of Oct. 31st, by "X.Y.Z.," on Mr. Parker's plan of propelling vessels, I would suggest to him the possibility of something like Giffard's Injector, being a power that will come into use as a propeller of vessels at a cheap rate; the great power that is exerted in feeding boilers, has surely some analogy to the propulsion of a body through water. If a jet of steam ¼-inch diameter can propel about 800 gallons of water per hour against 65 pounds pressure in boiler, surely a vessel where water is so easily got at would be more powerfully propelled by a jet of steam and water, than by a jet of steam and air, as in Mr. Parker's arrangement. If this will induce "X.Y.Z." or any other of your readers to think on the subject, my end will be gained. Yours respectfully,

Edinburgh, 4th Nov., 1862. A. J.

ARMOUR PLATES AND WOOD BACKING.

Sir,—As your correspondent "Civilian" invites discussion on opinions he has advanced, in reference to the impact of shot upon armour plates for vessels, I am induced to controvert one that forms an exception to the many excellent ideas contained in his papers, and one that has been impressed upon us so often as to look a little like a crochet. I allude to the alleged comparative worthlessness of wood as a backing to the armour. "The wood," he says, "offers no resistance worth speaking of to the crushing and penetrating effects" of shot. Now if he will limit his meaning here to what he subsequently says, that "in this arrangement there is nothing at the back of the armour plate *to aid it* in repelling the blow," I have little to object, for in respect to direct aid, nothing less than iron plate backing, or granite backing (as tried in some of the experiments); that is to say, nothing less than materials affording an intensity of local resistance, nearly equal to that of the armour itself, can offer much impediment to the bulging of the iron. A shot with the adequate velocity and mass to burst through it, against the slighter resistance of wood, the range of such resistance being only through so small a space as the depth of the bulge, will certainly do so with almost as much ease as though it were emerging into open space. But to advocate a backing of iron, in order to afford this "aid," is merely to say, that if to 4½ inch iron we add another inch or two of metal, whether separate or incorporate, we should be enabled to repel shot more efficiently than before. And to assert the fact that wood does not afford this kind of "aid," except in the slightest degree, is by no means the same as saying, nor does it follow as a consequence, that "wood offers no resistance worth speaking of," in the sense of total destruction to the passage of shot, whilst traversing the comparitive great distance of 18 ins. For the result of calculation is, that about 60 ins. of wood is sufficient to absorb the entire force of a 68lb. shot, moving with a velocity of 1,600 ft. per second. It would, however, I confess, be very desirable to ascertain whether the same result would be given by a direct experiment. I suppose they have put this point to the proof at Shoeburyness, and I suppose they know, or at least they ought to know, what are equivalents of thickness in wood and iron for equal resistances, from 2 in. plates up to the thickest yet penetrated, as determined by experiments for each case. For though calculation from one datum may be depended on pretty confidently in the case of wood, because the law of the resistance is known (unless indeed assumptions have had too much to do with it), yet in the case of iron, I suspect from the nature of the material that no law is known, and that in fact no law can be determined for the thorough penetration of plates, the results being likely to be very irregular. The measurement of indents upon immense solid blocks of iron might afford a formula not different perhaps from the ordinary one, but then it would be useless, for it is not probable that we shall ever prevent the thorough penetration of single plates, such as vessels will be able to carry. Only experiments for every case can be our trustworthy guide; mathematical science here, as upon almost all practical points, is a mere will-o'-the-wisp. However, the calculation I have given, although founded only upon a single Woolwich Academy experiment, is roughly sufficient for my purpose to convince "Civilian" of the great value of wood backing for the sake of its own resistance against a more than

half-spent shot, notwithstanding it may not at all "aid the armour-plate in repelling the blow." It is useful also in a very important manner to absorb the fragments of shot and plate.

Your correspondent appears to think also that a wood backing even facilitates the penetration of the plates. He says—"If the proposition were to prevent a 1-inch punch penetrating a ½-inch plate, would any man in his senses place it upon a wooden plank? Certainly not; for if he did, the machine would drive the punch through the iron." This remark does not display a practical knowledge of the manipulation of metals. A firm circumscribed support around the spot where a hole is to be punched, is precisely the means, as every blacksmith knows, to facilitate the operation; whilst a general elastic bearing, like that given by a "wooden plank," is the very means tending to defeat it. The fashioning of artistic forms in *repousse* worked upon thin sheet silver, would be endangered by the making of holes, if the artist had not a yielding resistance to punch against, produced by an appropriate backing to his work; wood, indeed, in this instance, would be too elastic, too efficient; there would be a general instead of a local depression. Your correspondent goes on to observe—"But if an additional thickness of iron were placed under the plate, or across the orifice of the die, the punch would not penetrate the plate." This is simply a truism, for it must needs be that a thicker metal, or what is equivalent to it, will be more repellant of punch or shot than one that is thinner. It is undoubtedly true, when a case is stated without limits or conditions, that iron for resistence is better than wood; and indeed for the matter of that, the opposite proposition is true also, that wood is better than iron. The question logically and usefully at insue is, what for *given* thicknesses are the comparitive values of iron and wood in the matter of resistance? And because wood is next to being worthless in the one particular, which is beside the question, of not preventing the plate-iron from bulging, "Civilian" concludes too largely, and even within the question, that it is almost wholly useless for resistance. This is jumping with a deduction into another fold, and if he is now inclined to put in a demurrer, I can only say I am unable then to perceive the pertinency of his reiterated denunciations, general and without making exceptions of wood for a backing; and that I should be puzzled to assign a meaning to such expressions as these, that "the iron plate has to do all the work," and that the "wood is only a medium for transmitting the blow to the ½-inch skin plate, and the ½-in. angle irons." The assumption is, that the plates are as thick as the ship can carry compatible with the uses for which she is intended, in which case it is as idle as it is truthful to propound, that thicker iron, whether in plates or in backing, would make her less vulnerable.

But there is a second question, which is more comprehensive, and that is, whether with a given weight of resisting materials (for there is a limited quantity which we are not permited to exceed), wood or iron is the most efficient in repelling shot? For though your correspondent should concede to me that a wood backing does indeed afford great resistance, he would still be entitled to argue that the weight of this wood given to an additional thickness, either of the armour plates or of the skin of the ship, would act more efficiently. For the present, I will allow that it would do so, but in this view of the subject there is omited the consideration that the resistance got from the wood backing is, in part, a resistance gained—an extra resistance, which does not altogether implicate a burden upon the buoyancy of the ship, inasmuch as the greater displacement produced is equal to nearly one half the increase of weight. As to the remaining portion of the backing, and turning the discussion now upon the merits of the question, I do not know what its resisting power is, in comparison with an equal weight of iron, though, as I have already said, they ought to know at Shoeburyness. But to make an approach to some conception thereof, let 6 in. thickness of iron be as much as a 68-lb. shot, with a velocity of 1600 ft. per second, can only just pierce; this result compared with the penetration in wood which I have already calculated at 60 ins., will give the equivalent depths for equal resistances of 1 and 10. Now the thicknesses of iron and wooden defences for equal weights, are about 1 and 6, so that the ratio of 10 to 9 is not great against oak wood, and in the case of teak wood, which is lighter, and judging from its resistance to crushing, is at least equally capable of resisting penetration, the ratio would be 11 to 10 in its favour. I do not rely, as you, sir, know very well, with too great confidence upon mathematical calculations, but the information they give me is all that I can get at present, and I think they may be trusted to the extent of teak wood being equal to iron, weight for weight. Even if it were not so, the many utilities belonging to wood, would countervail any difference that is likely to exist, and therefore I am of opinion, in opposition to "Civilian," Mr. Fairbairn, Mr. Scott Russell, and others, that provided we have armour sufficiently thick to keep out shells, all the rest of the defence should be of wood. And as to Mr. Whitworth's flat-headed shells, I think they are likely to fail with impact at any angle at which round shot will fail; but with this difference, that whilst a ball would simply glance, an elongated shell would also throw a somersault. I conclude with the remark that, if "Civilian" wants experiments to be made, as he says, "with different kinds of backing, calculated to prevent projectile punches being driven through armour plates," he must seek for something lighter than water, otherwise the ship cannot be supposed to be armoured so heavily as she ought to be; and if under this peremptory condition of lightness it is possible to find anything better than wood, I wish he may get it.

Yours, &c.,

Oct 27. BENJ. CHEVERTON.

Meetings for the Week.

MONDAY.—ROYAL GEOGRAPHICAL SOCIETY.—Sir R. Murchinson, in the chair. Latest explorations in Australia, by Landsborough, Walker, McKinlay, Howitt, &c., at 8.30 p.m.

TUESDAY.—INSTITUTION CIVIL ENGINEERS.—On the railway system of Germany, by R. Crawford, Esq., A.I.C.E., at 8 p.m.

THURSDAY.—CIVIL AND MECHANICAL ENGINEERS' SOCIETY.—On steam, by F. Campin, Esq., E.C., president, at 7.30 p.m.

Gossip.

TRIAL OF THE APOLLO.—On Thursday last week the new paddle-steamer "Apollo," built and engined by Messrs. Caird and Co., of Greenock, for the Bristol and Cork trade, proceeded down the Clyde on an official trial trip, the directors, engineer, and other officials of the company being on board. The average speed per hour attained, as tested by running the lights, was 14 knots, and as this speed was got in unusually rough weather, all on board were highly gratified with the result. The following are some of the principal dimensions of the new vessel:—Length, 220 ft.; beam, 26 ft.; depth, moulded, 14½ ft.; draft of water, 10 ft.; 735 tons O. B. M. The vessel is made to load, if necessary, on the ground without injury, and to shift without ballast. The hurricane deck amidships is 60 ft. in length, under which good cover is obtained for carrying horses. The full poop, of 65 ft. in length, is 7½ ft. from deck to deck in height, and the saloon is handsomely fitted for the accommodation of 65 passengers. The 'tween decks are very roomy and airy, and are fitted for carrying cattle, walking stages being provided at each hatch to enable stock to pass up and down conveniently. The engines are on the oscillating principle; cylinders 60 in. in diameter, stroke 66 in. in length. The three tubular boilers, carrying a pressure of 20 lbs. on the square inch, are made with dry bottoms. The "Apollo" left Greenock for Bristol a few days since, and on her voyage encountered very stormy weather, which well tested her sea-going qualities. The weather, however, moderated on reaching Kingston, and the run from that port to the Severn was made easily in 14 hours. She will be placed at once on her station between Cork and Bristol.

In the *Melbourne Argus* we find the following allusion to the mineral wealth of Australia:—"During the recess we despatched a special reporter to the gold-fields, to examine and report upon their state, as well as the condition of the miners, and the position and prospects of mining generally. Eleven of his letters have appeared in the *Argus*, and, so far as they have gone, they are entirely reassuring, showing that, even on our oldest gold-fields, mining is only at its commencement. The alluvial fields are still unexhausted, and auriferous quartz-reefs, without number, lie untouched in every district, for want of capital and labour. Attention has been drawn to our mines of antimony, silver, and iron, of which little or nothing was popularly known previously. The effect of these letters has already been to assist in restoring confidence in the resources of the colony, and to stimulate enterprise in new mining directions."

A prospectus has been issued of the Aerated Bread Company, to supply London with bread manufactured under the patents of Dr. Dauglish. The proposed capital is £500,000, of which £100,000 is to be first issued in shares of £10 each. The new method, by substituting machinery for hand labour, insures cleanliness, expedition, and certainty.

The Association of Foremen Engineers held the first of their winter series of meetings on Saturday, the 1st inst., at their rooms, 35, St. Swithin's-lane, City. Steadily increasing in numerical strength and in financial resources, this comparatively young society has fairly established itself among the literary institutions of the metropolis. During the meeting on Saturday, it was resolved unanimously to present a testimonial to Mr. Joseph Newton, H. M. Mint, honorary president of the Association for the last three years, for the zeal with which he has laboured in behalf of its interests. The next meeting is appointed to take place on the first Saturday in December, when a paper on the "Machinery in the International Exhibition" is promised. There is no doubt whatever that to the foremen of the various engineering establishments of the United Kingdom, as well as the heads of firms, the public are much indebted for the glorious mechanical display lately visible at South Kensington, and the remarks of a member of the former class thereon will be found, we should think, instructive.

INSTITUTION OF CIVIL ENGINEERS.—The Council of the Institution of Civil Engineers have awarded the following premiums:—1, A. Telford Medal, the Manby premium, in books, and a Stephenson Prize of 25 guineas, to Charles Augustus Hartley, M. Inst. C.E., for his "Description of the Delta, and of the Works recently executed at the Sulina Mouth of the Danube."—2, A. Telford Medal and a Miller Prize of 15 guineas, to John Henry Muller, of the Hague, for his paper "On Reclaiming Land from Seas and Estuaries."—3, A Telford Medal, and a Miller Prize of 15 guineas, to John Paton, M. Inst. C.E., for his paper "On the Sea Dykes of Schleswig and Holstein, and on Reclaiming Land from the Sea."—4, A Telford Medal, to James Abernethy, M. Inst. C.E., for his "Description and Illustrations of the Works at the Ports of Swansea, Silloth, and Blyth."—5, A Telford Medal, to John Bailey Denton, M. Inst. C.E., for his paper "On the Discharge from Underdrainage, and its Effect on the Arterial Channels and Outfalls of the Country."—6, A Watt Medal, to Joseph D'Aguilar Samuda, M. Inst. C.E., for his paper "On the Form and Materials for Iron-plated Ships, and the Points Requiring Attention in their Construction."—7, A Council premium of books, to James Brunlees, M. Inst. C.E., for his paper on "Railway Accidents, their Causes and Means of Prevention."—8, A Council premium of books, to Captain Douglas Galton, R.E., F.R.S., Assoc. Inst. C.E., for his paper on "Railway Accidents, showing the Bearing which existing Legislation has upon them."—9, A Council premium of books, to Henry Charles Forde, M. Inst. C.E., for his paper on "The Malta and Alexandria Submarine Cable."—10, A Council premium of books, to Charles William Siemens, F.R.S., M. Inst. C.E., for his paper "On the Electrical Tests employed during the Construction of the Malta and Alexandria Telegraph, and on Insulating and Protecting Submarine Cables."—11, A Council premium of books, to James Atkinson Longridge, M. Inst. C.E., for his paper on "The Hooghly and the Mutla."—12, A Council premium of books, to James Oldham, M. Inst. C.E., for his paper "On Reclaiming Land from Seas and Estuaries."

We learn, says the *Manchester Guardian*, on the authority of a gentleman of the highest respectability, that a wonderful discovery has recently been made in electricity as applicable to the purposes of the electric telegraph. Incredible as it may seem to many of our readers, it is said that experiments have established the fact that intelligible signals can be exchanged between distant stations without the intervention of any artificial conductor whatsoever, and that with equal success, whether the intervening space be wholly or partially land or water. The *modus operandi* has not been disclosed to us, and we are unable to say to what various services this invention may yet be applied. But the promoters of the new system believe it to be a reasonable expectation that this discovery may render unnecessary any future attempt to lay an Atlantic cable. We remember that, many years ago, this achievement was regarded by some scientific men as a speculative possiblity.

It appears from a blue book just issued that the select committee appointed to inquire into the expenditure incurred since the begining of 1858, on the various kinds of improved ordnance, whether obtained by contract or manufactured in the public

departments, and results obtained by such expenditure, have agreed to the following report:—"Your committee, having investigated the subject, referred to their examination, have taken certain evidence, which, on account of the advanced period of the session, they have agreed to report to the House; and they recommend that a committee on the same subject should be appointed in the next session of Parliament."

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

The Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the Proprietors of this Magazine. Other Papers are hereby warned not to produce them without an acknowledgement:—

Steam Engines, &c., 1008, 1016, 1041, 1046, 1056, 1059, 1061, 1063.
Boilers and Furnaces, 1012.
Roads and Vehicles, including railway plant and carriages, saddlery and harness, &c., 1020, 1025.
Ships and Boats, including their fittings, 1027, 1035.
Cultivation of the Soil, including agricultural implements and machines, 1000, 1052.
Food and Beverages, including apparatus for preparing food for men and animals, 1099, 1018, 1028.
Fibrous Fabrics, including machinery for treating fibres, pulp, paper, &c., 1002, 1003, 1006, 1007, 1010, 1011, 1022, 1031, 1047, 1048, 1053, 1055, 1064.
Buildings and Building Materials, 1014, 1038.
Lighting, Heating, and Ventilating, 1021, 1023, 1043.
Furniture and Apparel, including household utensils, time-keepers, jewellery, musical instruments, &c., 1024, 1036, 1037, 1039, 1044, 1045, 1049, 1054, 1057.
Metals, including apparatus for their manufacture, 1005, 1029, 1034, 1040, 1062.
Chemistry and Photography, 1030, 1042.
Electrical Apparatus—none.
Warfare, 1004, 1013, 1033, 1051.
Letter-Press Printing—none.
Miscellaneous, 1001, 1017, 1019, 1026, 1032, 1058, 1060.

1000. B. Sharpe. *Improvements in harrows and rakes.* Dated April 8, 1862.

In constructing a harrow suitable for harrowing grass lands, for distributing manure thereon, and also for harrowing other land, a bar, with wheels at the ends, is used in front of the implements, and to this bar shafts or suitable means for attaching a horse are applied. Behind the bar three frames of teeth are applied, they being connected to the bar by suitable links. These frames of teeth are each made in two halves, hinged to each other, and to a plate or frame having as many holes as there are teeth in the frame, so that by lifting either of the two sections of which a harrow is formed, the teeth are forced up through the holes of the plate or frame which retains its position, by which means the several teeth will be caused to deposit any accumulation which they may have gathered. Behind these harrows there are three or other number of parallel bars, at a distance apart, connected to each other at the chains by chains, and behind each bar is a chain, the ends of which are fastened to the ends of the bars, the chains being somewhat longer than the bars, so that whilst the bars retain their straight positions, the chains assume curved lines as they are drawn over the land. In order that the teeth of the horse-rakes may from time to time be caused to deposit the accumulation of materials raked up by them, a cam, or projection, is applied on one of the wheels, which, in its rotation, acts on a lever which carries the teeth to be lifted and held off the land until they have deposited their accumulation on to the land. In some cases a horse-rake is made with four sets of teeth, the arms of which are connected with the bar or axle of the wheels, such arms radiating from such bar or axle; and the teeth of each set may be so arranged as to be turned back on hinges or axes, so as for a time to be out of action, whilst other sets of the teeth are in action; or all the sets of teeth may be in action at one time. In using a horse-rake thus constructed, the sets of teeth which, for the time, are not turned out of action, come into work in succession, and they are released and allowed to go out of action by projections on the wheels or otherwise, so that when one set of teeth have, for a time, accumulated hay or other matters on the land, that set of teeth will be released, and will go out of action whilst the next set of teeth will come into position below the bar or axis, and will be retained until, by the rotation of the wheel, this set becomes free to go out of action in a similar manner to the first-mentioned set. *Patent completed.*

1001. H. A. Holden and C. Weekes. *Improvements in apparatus used in drawing water or other fluids from cisterns, tanks, and other vessels.* Dated April 8, 1862.

For this purpose the outlet pipe enters the bottom of the cistern or vessel, and to the end of this pipe is connected a flexible pipe; this pipe is of such a length that its mouth, or open end, can be raised above the level of the water or fluid in the cistern or vessel, so that no water can pass away through the outlet pipe, but when the mouth or open end of the flexible pipe is depressed below the water level, the water can flow freely through the outlet pipe. In order to raise and lower the mouth of the flexible pipe, the inventors prefer to connect it to one arm of a lever, the other arm of which lever projects beyond the edge of the cistern or vessel, so that by acting on this arm the mouth of the flexible pipe may be raised or lowered. *Patent abandoned.*

1002. E. B. Sampson. *Improvements in apparatus for supplying oil or other liquid to wool as the same is fed into carding engines.* Dated April 8, 1862.

For the purposes of this invention a trough or vessel is placed below the lower feed roller of a carding engine, such trough or vessel being somewhat longer than the feed rollers. Into this trough or vessel the oil or other fluid is placed, and such oil or other fluid is kept constantly supplied to the under surface of such lower roller by its dipping into and being partly immersed in the oil or liquid in the trough or vessel; or in place thereof there is a roller or endless band partly immersed in the trough or vessel, the upper surface of which is in contact with the under surface of the lower feed roller. By either of these arrangements the surface of the feed roller will have oil or other fluid uniformly spread over all parts of its surface with which, for the time, the wool is in contact. The wool is supplied to the feed rollers by an endless apron as heretofore, in such manner, however, as to feed the wool nearly up to the nip of the feeding rollers, and as the wool passes off the feed apron it comes in contact with that portion of the under feed roller upon which oil or fluid has been spread, as above explained. *Patent abandoned.*

1003. J. Lawson. *Improvements in balling cotton and thread.* (A communication.) Dated April 8, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1004. J. Wright. *Improvements in joining together armour and other thick metal plates, beams, and girders.* Dated April 8, 1862.

In carrying out this invention the patentee slots, planes, or in any convenient way makes one or more dovetails in the materials to be operated upon, the oblique sides of which are also oblique to the surface, that is to say, the two opposite sides of each dovetail are to be oblique to the end or side, and also oblique to the two surfaces of the plate, girder, or beam. This obliquity of the sides of the dovetails to the surfaces is a little more in one plate or half beam or half girder than in the other, so as to permit of a taper key to be forced or driven in between those two pairs of oblique sides of the dovetail, and thus by means of these keys draw and bind the plates or component parts of the beam or girder together. In beams the obliquity might be dispensed with, and rivets or screws used to form the dovetail. *Patent completed.*

1005. T. Cobley and J. Wright. *Improvements in the method of, and the apparatus for, heating auriferous and argentiferous minerals and ores, for the purpose of extracting and separating the gold and silver from the other metals, minerals, and substances combined therewith. Also in the method of treating the various residues resulting therefrom, and in the utilization, application, and use of the said residues when so treated.* Dated April 8, 1862.

We cannot here give space to the details of this invention. *Patent completed.*

1006. S. Rodgett. *Certain improvements in power looms for weaving.* Dated April 9, 1862.

This invention is designed for the purpose of dispensing with the weights hitherto employed to weigh the yarn beam at the back of the loom, and consists in the novel application of a screw and nut, or screws and nuts, to the friction rope coiled round the yarn beam. One end of the rope is furnished with a screw, and the rope is coiled round the "beam" as usual, and thence passes under a pulley guiding it to the rocking or slay shaft, to which it is attached by means of a nut, in such a manner as to be adjustible, so that, as the slay vibrates, the tension of the yarn is varied; when shedding it becomes slightly slackened, and tightened when "beating up." *Patent abandoned.*

1007. J. E. H. Andrew. *Improvements in looms for weaving.* Dated April 9, 1862.

This invention consists, 1, in applying to the improved horizontal picking motion a metal picking sword, instead of the ordinary picking stick, to which is forged or otherwise connected a socket containing a picker of leather, or other suitable substance; and the said picking sword may be cranked to work in the drop-box of a loom. 2, In improvements connected with leading or pattern chains for regulating the movements of the drop box, and giving a sliding movement to, or reversing the motion, of the pattern, cyclinder, or barrel, or parts thereof, or for other requirements in fancy weaving. *Patent completed.*

1008. S. Farrow. *Improvements in machinery or apparatus for regulating the supply of steam from the boiler to the cylinder or pipes of steam engines, which improvements are also applicable to gases or fluids.* Dated April 9, 1862.

This invention consists in the employment of a small cylinder closed at the bottom, and having in its interior a piston exposed at the top to the pressure of the atmosphere, and also to the action of the lever and weight. The steam, gas, or fluid is admitted to the small cylinder through two internal apertures, and passes into the interior of the piston through two corresponding apertures, and from thence through a larger aperture to the exit pipe of the small cylinder leading to the steam engine cylinder pipes or other requirement. At the front of the larger aperture of the piston there is a thoroughfare leading to the underside of the piston, so that the steam, gas, or fluid may raise it according to their pressure, and the resistance of the lever and weight, so that when the apertures of the small cylinder are fully open to the apertures of the piston, the supply of steam, gas, or fluid is at its maximum, but as the piston rises from its under pressure, the apertures of supply are being closed exactly in proportion to the weight upon it, and thereby regulate the supply in a self-acting manner. *Patent completed.*

1009. G. Hollinshed. *Improvements in sandwich cases and similar articles.* Dated April 9, 1862.

This sandwich box or case is composed of two main divisions, distinct from each other, namely, the receptacle and the cover. The receptacle is formed of four sides hinged to the bottom or rim in such manner that they can be raised to a vertical position, and from the box or case when it is required for use, and folded downwards upon the bottom, then placed within the rim of the cover, so as to occupy but little space when the box or case is not required for use. The sides are provided with hooks and eyes, or other fastenings, for the purpose of holding them together when they are placed in a vertical position. *Patent completed.*

1010. J. Bullough and J. Bullough. *Improvements in looms for weaving.* Dated April 9, 1862.

In carrying out this invention, instead of the usual mode of causing the crank which gives the lay its to and fro motion to be driven at one uniform speed, the patentees give it less speed during one part of its revolution than the other part, for the purpose of allowing the shuttle time to pass along the race, and thereby enable the loom to be worked at an increased speed. They attain this object by means of eccentric toothed wheels and chain, by intermittent surfaces, and also by eccentric surfaces in combination with weights or springs. Another part of the invention consists in an improved arrangement for stopping the loom when the weft thread breaks or is absent, and also for causing the shuttle to stop at the setting on side and arresting the lay at or about the best position. *Patent completed.*

1011. W. Taylor. *Certain improvements in machinery or apparatus for preparing and spinning cotton or other fibrous materials.* Dated April 9, 1862.

This relates, 1, to a simple and effective arrangement of apparatus in the drawing frame for preventing the passage of drawing from the rollers to the coiler motion, or undue waste of material through rollers lapping, by the instant stoppage of such machine if the sliver becomes broken, or when a snarl or lump is formed that cannot pass through the cone trumpet or guide. The second part consists in an arrangement of apparatus for the stoppage of the drawing frame, or any given or desired weight or length of drawing being deposited in the cans, so as to prevent waste and damage to the drawings through the cans becoming overloaded. The third part consists in an arrangement of apparatus for preventing single slubbings or rovings from passing on to the bobbin, and where an end breaks, through roving, lapping, or other cause, the machine or frame is instantly stopped. The fourth part consists in an arrangement of apparatus to be applied to warping and winding frames, and bobbin or cop reels, so that, if any one end or thread breaks, the frame or machine is instantly stopped. *Patent completed.*

1012. W. Davis. *Improvements in puddling, balling, and re-heating furnaces.* Dated April 9, 1862.

Here, in place of using a horizontal grating of fire bars, the bars of which are laid in a direction from front to back of the fire-place, inclined gratings of fire bars are used, one half of the grating of a furnace inclining from one side to the middle, and the other half inclining from the other side, so that the lowest point is in or about the middle of the fire-place, and the fire bars are, as heretofore, laid in a direction from front to back of the fire-place. *Patent completed.*

1013. J. Jones. *Improvements in constructing and arming ships and vessels.* Dated April 9, 1862.

In order that the power of steam may be employed when along side of an enemy's ship to make a hole therein below the water, provision is made in constructing a ship or vessel, and in applying steam machinery thereto, for employing what may be termed a steam battering-ram, adapted to produce the effect above mentioned. For this purpose, at the bow or other part or parts of a ship or vessel (suitably constructed to resist projectiles, and to be propelled with as much speed as may be) a ram or rams is or are applied. Each ram consists of a shaft or bar capable of sliding water-tight to and fro through the bow or other part of the ship or vessel. The inner end of this bar or shaft is in connection with the piston of a steam cylinder, so as to be worked by steam quickly to and fro in a suitable manner to a steam hammer. *Patent completed.*

1014. J. Langston. *Improvements in the manufacture of Portland cement.* Dated April 9, 1862.

Here the patentee employs, in grinding the materials, only so much water as will make a dough or paste, suitable for being at once dried without the separation of water by settling. The drying apparatus he employs consists of ovens heated by furnaces or fire bars below, and the flues from these furnaces pass over the top of the ovens in the vaulting of the roof. Ovens so arranged will dry the materials more rapidly than the open floors, and with smaller expenditure of fuel. The passing the materials from the grinding apparatus to the drying ovens without the use of the settling ponds renders it necessary that no lumps should be allowed to escape the grinding apparatus; hence he employs, to effect or to complete the grinding rollers, set at a short distance the one from the other, and between which the materials are caused to pass; or a roller revolving at a short distance from a stationary surface may be employed. *Patent completed.*

1016. J. Knowelden. *Improvements in steam, water, and other fluid engines.* Dated April 9, 1862.

The patentee constructs the frame, and fixes the cylinders of engines worked by steam, water, or other fluids, as follows:—For condensing engines, he forms the frame hollow, so as to form the condenser, and, if convenient, round. He fixes to this frame one or more cylinders, but in all cases he prefers an uneven number. He makes a division, so as to form it into two separate chambers, into one of which the water to supply the boiler is admitted, which, meeting the first discharge of the steam from the exhaust pipe, causes partial condensation thereof, while, at the same, the water becomes heated; that portion of the steam remaining uncondensed passes into the second chamber, when, again meeting with a further supply of cold water, the condensation is completed. For agricultural and other portable engines, he construest the casing of the boiler of sufficient length to form the frame, in which he fixes any number of

cylinders, but of these, by preference, three. In locomotive and traction engine he fixes the cylinders to a round framework, which may be connected to, or which may form the wheels. He makes the crank shaft of the engine hollow, to form the steam and exhaust pipes, and he fixes the crankshaft to the springs or frame of the boiler or carriage; or the cylinders may remain stationary. Secondly, he constructs cylinders and pistons as follows:—If for open cylinders or trunk engines the piston is bored to form the joint of the connecting rod, and is fitted with a cap or gland, and bored spherical, so as to allow the piston free action. He also constructs the cylinder covers and bottoms with a chamber, between which and the cylinder he fixes a diaphragm of any suitable material, and a frame or grating to prevent the same being forced in the cylinder. He establishes a connection between the chamber and the supply pipe, to equalise the pressure in the cylinder, thus leaving the diaphragm at liberty to move by priming or other causes. In steam engines, where surface condensers are used, he forms the condensers of a series of flat chambers, through the centre of which passes a pipe, with small holes made in each chamber; the chambers are held together by bolts passing through collars, leaving sufficient space to allow the condensed water to return, the steam first passing through the casing of the engine, the lowest part of which is made to form a chamber to receive the first steam and injection water, so that it may be returned to the boiler hot. The water from the air pump is passed through a rotary refrigerator, which at the same time gives motion to the water acting on the condenser. *Patent completed.*

1017. W. E. NEWTON. *An improved apparatus for raising and forcing water and other liquids.* (A communication.) Dated April 9, 1862.

This consists, principally, of a steam or compressed air pipe, the mouth of which enters, and is surrounded by, a socket, in which is an opening for the admission of water or other liquid to be raised from the well, reservoir, or other source of supply, and from which a delivery pipe leads to the point where it is to be delivered, the direction of the steam or air pipe being the same as that of the contiguous portion of the delivery. The issuing steam or compressed air expels the water from the delivery pipe, and creates a vacuum behind it. The place of the water that is so expelled is supplied by water drawn up to fill the vacuum, or forced up into the socket from the well, reservoir, or other source by the pressure of the atmosphere. *Patent completed.*

1018. W. MAYS. *Improvements in machinery for grinding corn and other substances.* Dated April 9, 1862.

This relates, principally, to a novel arrangement of parts for connecting the drawing gear with the top stone of a mill, and consists in the employment of a spring griping arrangement. The cross-piece, instead of fitting loosely between the checks, is made to bear against two moveable blocks, which project through the checks, and are forced up against the cross-pieces by means of strong springs. In order to conduct air down the eye of the stone, inclined flanges or guides are adapted to the eye-block, so that as the runner rotates the air may be guided downwards in an oblique direction to the grinding surfaces below. *Patent abandoned.*

1019. R. THEYSON. *Improvements in cork-cutting machinery.* Dated April 9, 1862.

This consists in a machine which cuts corks by thin steel cylinders sharpened at one end, being made to pass perpendicularly through cork wood, which has previously been cut into strips as long as they can be got. The width or height of the strips will give the length of the corks, and their thickness will correspond with the diameter of the cylindrical knives, for each of which the strips suitable must be sorted. These strips are put into the machine, which is self-acting in all its parts. By this machine cylindrical corks of all lengths and thicknesses can be cut at the rate of from 30 to 60 per minute, according to the size of the corks to be cut. *Patent completed.*

1020. E. FUNNELL. *A self-acting indicator signal for railways.* Dated April 10, 1862.

This consists of a dial plate erected on the top of a pillar; the dial is divided into three parts, red, green, and white, and is divided to mark the time of ten minutes, and is also furnished with an indicator, which revolves backwards on the passage of a train, after which the hand returns and records the number of minutes since the trains passage, by which the driver of a succeeding train can regulate his speed accordingly. On the upper portion of the dial is fixed a lens, by which transparent colours are given for night signalling, by the aid of gas or lamp. After the passage of a train, red light shows for five minutes, which then disappears, and shows green light for five minutes, after which bright light remains until the passage of another train makes contact, by which the movements are again repeated. *Patent completed.*

1021. D. FRYER and W. J. WILLIAMS. *Improvements in the method of, and apparatus for, letting on and cutting off the supply of gas to groups or districts of streets and other lamps from a central point or depot.* Dated April 10, 1862.

This consists in applying to the ordinary branch gas tube which supplies each lamp a flexable air-tight junction of india rubber, or such like material; that is to say, the gas tube may be severed and joined with a piece of flexible tube having air tight joints; on each side of the tube may be placed two small plates to act as nippers, so that, if they be compressed by any force, they will nip the flexible tube and close the passage. The inventors now enclose the flexable portions in an air tight flexible chamber, formed of materials capable of allowing it to collapse and expand without fracture when the air is withdrawn or forced into it. With this arrangement it will be seen, that if the air by any means be extracted from the air-tight flexible chamber, it will collapse, and the external pressure will cause the nippers to grasp the flexible tubes, and thus close its passage and cut off the supply of any gas passing through to the lamps; and upon the equilibrium being restored by the admission of air, the current of gas will be shut on the nippers relaxing their grasp from this relaxed pressure. If, on the other hand, the air be forced into the chamber, the increased pressure will act in a similar manner. *Patent abandoned.*

1022. W. ARMITAGE. *Improvements in looms for weaving.* Dated April 10, 1862.

This relates to the taking up motion, and consists in improved modes of making it positive. From one end of the sword arms or other working part of the loom motion is given by a connecting rod to a double lever, having a series of catches above and below the centre of oscillation, which catches give continuous motion to a ratchet wheel communicating by bevel or spur gearing, or worms and worm wheels with the taking up beam. In one of the arms of the double lever there is a circular slot, in which a stud at that end of the connecting rod descends, for the purpose of gradually shortening the traverse of the catches as the cloth increases in diameter. This descent of the connecting rod is obtained by jointing it near the stud to one end of a second double lever, having at the opposite end a slot, in which is one of the ends of a rod or lever resting on the cloth. The extreme ends of the rod or bar slide in angular slots or grooves fixed to the framework of the loom, so that, as it rises with the cloth, it moves towards the interior and shortens the length of the second double lever on that side, so as to give a gradual increasing movement on the lever on the other side, and cause the connecting rod to descend in the slotted arm of the first double lever with a gradually increasing movement, so as to shorten the traverse of the catches and retard the revolution of the ratchet wheel exactly in proportion to the winding on of the cloth, and thereby produce an efficient positive taking up motion. *Patent abandoned.*

1023. W. NUNN. *Improvements in the construction of lanterns for ships and signals.* Dated April 10, 1862.

This consists in fixing the lenses on detached metal or other frames which can be attached to the lantern by screws, or made to slide into their required position in grooves formed in the frame of the lantern, and be fixed there by screws, springs, or bolts, or any other suitable means. These grooves may either be on the outside or inside of the frame of the lantern, and may be made to receive one or more lenses, according to the purpose for which the lantern is required. By these means a lens, when broken or injured, may be removed and replaced by a new one in a few minutes by an unskilled workman. *Patent completed.*

1024. J. HOUGHTON. *An improved haversack.* Dated April 10, 1862.

This consists in forming haversacks with two divisions or flaps with pockets therein, so that when suspended in the middle, the one flap may hang over and cover the other flap. *Patent completed.*

1025. A. BLACK. *Improvements in swing-bridges adapted for crossing lines of railways and other ways.* Dated April 10, 1862.

This consists in so constructing a bridge, that it shall be capable of being readily and easily moved or swung from its original transverse position, into a longitudinal position with the lines of rails or permanent ways, and thus allow railway trains to pass clear of the said bridge. This improved bridge is so constructed as to close or fold up into a very small compass. *Patent abandoned.*

1,026. J. LILLYWHITE and T. NIXON. *An improved bowling apparatus for cricket balls, to be called "the balista."* Dated April 10, 1862.

This bowling apparatus is constructed as follows:—On a foundation plate of iron, which is to be pegged or fastened to the ground behind the wicket, a standard is secured, on the top of which a horizontal bar is so arranged by a pivot (to which it is hinged) working in a socket in the standard as to allow of being turned horizontally thereon. One end of this bar is furnished with a cross piece, each end being bent upwards to form vertical arms, to which are attached the ends of a powerful vulcanized india-rubber strap or band; the other end of the bar is also bent up, and the centre of the band is pulled back thereto by a leather loop, and held by a catch, and the ball having previously been placed in the centre of the band, while being drawn back, will be firmly retained by the compression of the rubber. A trigger is arranged to work on a pin let into the bar, and is acted upon by coming into contact with a projection on the top of the standard. The apparatus is to be so placed that when charged by the ball, the ball shall be set at right angles to the line of the wickets; when the ballsman is ready, the bar is turned on its axis, and on arriving in a line with the wicket, the projection acts upon the trigger and catch and releases the india-rubber band, projecting the ball accordingly. Regulating screws, situated near the pivot, elevate or depress the bar, and the direction of the ball, and also regulates the discharge thereof by contact with the projection and trigger. *Patent abandoned.*

1027. C. P. COLES. *Improvements in masts for ships.* Dated April 10, 1862.

This invention consists in constructing masts of a central and two side tubes of iron or steel. The tubes pass through and are keyed to the decks, the central tube being carried in a direct line, while the two side tubes extend from the central tube at their bases, and are carried up at an incline till they unite with the central tube at or near the upper part. The central tube is continued upwards to form the topmast, or a separate tube is fitted thereto. The mast becomes, as it were, self-supporting, and shrouds and other supporting rigging are dispensed with. *Patent completed.*

1028. G. D. MERTENS. *Improvements in the preparation of materials to be employed in the making of beer, and in the machinery or apparatus employed therein.* (A communication.) Dated April 10, 1862.

This relates more particularly to an improved system or mode of treating worts with a view to the solidification of the same, whereby the preparation may be easily kept for any length of time in any climate, and be subsequently used, when required, for the manufacture of beer, by simply dissolving in water. According to this invention it is proposed to evaporate the worts in a closed vacuum pan, heated by steam heat, and having a suitable exhauster in connection therewith, for the purpose of facilitating and expediting the process of evaporation at a low temperature, so as to prevent any charring of the substance, and for the same object it is of the greatest importance that the substance under treatment be kept in a constant state of agitation. *Patent completed.*

1029. L. CHRISTOPH, W. HAWKSWORTH, and G. P. HARDING. *Improvements in drawing metals and in the machinery or apparatus employed therein.* Dated April 10, 1862.

This relates to a peculiar system or mode of drawing metals, whether of a tubular, hollow, or solid section, and consists in the application to that purpose of hydrostatic pressure, in lieu of the ordinary mechanical power heretofore adopted. In carrying out this invention, the patentees employ a hydrostatic cylinder and ram, the gripper bars being secured to the end of the ram, whilst the draw plates or "wordles" are fitted into a suitable support or flange cast on the cylinder. *Patent completed.*

1030. H. DEACON. *Improvements in the manufacture of caustic soda.* Dated April 10, 1862.

This consists in stopping the evaporation of the caustic liquors at an earlier stage than at present, removing the salts precipitated during evaporation as usual, and continuing the evaporation or concentration until the caustic alkaline liquor will deposit crystals of hydrated caustic soda on cooling to the ordinary atmospheric temperature. These crystals of hydrated caustic soda, after the mother liquors have been separated therefrom, are nearly pure, or sufficiently so for commercial purposes. It consists further in effecting the separation of the mother liquors from the crystals of the hydrate of soda. This the patentee prefers effecting by the application of a small amount of heat in any convenient vessel and way. *Patent completed.*

1031. J. PLATT, W. RICHARDSON, and W. HOLLAND. *Improvements in carding engines.* Dated April 10, 1162.

This invention is not described apart from the drawings. *Patent completed.*

1032. J. PETRIE, JUN. *Improvements in machinery or apparatus for blowing and exhausting air.* Dated April 10, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1033. G. BURGE. *An improved means of protecting forts, ships, and other structures and places against projectiles and other striking bodies.* Dated April 10, 1862.

Here the patentee uses a moveable body, hereinafter called a shield, that is to say, a body capable of receding, retiring, or recoiling, or of moving backward or inward when struck with sufficient force, and which may also, if desirable, be so arranged that, after having been so moved, it shall be returned or restored to its previous position by balance weights or other contrivances; and he applies this shield to the ship, fort, or other structure or place (to be protected) in such wise that it shall present an outward face, front, or surface of iron or other metal and material, to resist or receive the blow of the projectile or striking body. The shield may, if desired, be constructed hollow, and be filled or loaded with iron or other material. Any required number of shields may be used. There are other modifications. *Patent completed.*

1034. C. BARTHOLOMEW and J. HEPTINSTALL. *Improvements in making circular blooms such as are used in the manufacture of tyres, and for other purposes.* Dated April 10, 1862.

In making a circular bloom of iron, after the iron is made and rolled into a puddled bar, it is then cut into segments or radial pieces; that is to say, the puddled bar is divided into pieces of equal and comparatively short lengths by cutting it across at an angle, the ends being made to slope alternately in either direction, and in such a manner that if the pieces be laid round in a circle, their longer sides outwards and shorter sides inwards, they will butt accurately end to end, and make up a complete polygonal wing. The mode in which the pile is made for the bloom from these segments, or radial pieces, is as follows:—A smaller bar of iron of sufficient length is coiled round a mandril, so as to produce a flat coil of sufficient width to form the top and bottom of the intended pile. Upon the bottom coil a circle of the pieces of flat bar above-mentioned is placed, and upon that circle another circle of pieces is built, so as to break joint with the pieces below, and then another circle of such pieces of iron is placed likewise breaking joint, until a sufficient thickness is obtained; upon the whole, a top coil, similar to the bottom coil, is placed, and the pile is, when completed, ready to be placed in the ball furnace, and when it has attained sufficient heat, it is then put in a die, of the requisite form for producing the bloom of the required outside shape, when it is struck by a steam or other hammer of the requisite power and weight to thoroughly weld the pile into the requisite form. *Patent completed.*

1035. O. REYNOLDS. *Improvements in building ships and other vessels.* Dated April 10, 1862.

For the purposes of this invention in constructing the lower parts of a ship or vessel, wedge-formed timber is used, the thinner edge of the wedge being inwards, and the thicker edge outwards; between each stroke of these wedge-formed timbers there are plates of iron or steel as wide as the wedges or filling pieces of timber. The wedges and the plates of iron both run in a direction fore and aft of the ship or vessel, and, by reason of the filling pieces of timber being wedge-shaped, the required curved form for the bottom of a ship or vessel is obtained. Through these wedge-formed timbers, and through the plates of iron or steel between them, screw-bolts are passed, and the whole strongly screwed together. The walls of a ship or vessel are similarly constructed. The plates of iron or steel between the horizontal layers of timber used in forming the sides of a ship or vessel, from some distance below the water-line upwards, are formed with thick massive outer edges, which overlap the filling pieces of wood, and form the outer surface of a ship, so that a ship may be capable of resisting shot and other projectiles, and also to make the body of the ship of great strength. The layers of wood, and the plates of iron or steel used in forming the sides of the ship, are perforated to receive upright screw-bolts to screw or compress the whole of the layers together at proper intervals. *Patent abandoned.*

1036. T. B. DAFT. *Improvements in coverings for the feet.* Dated April 10, 1862.

According to this, the inventor makes what he calls a vulcanised india-rubber mocassin from two flat pieces of short india-rubber compound, which are connected together at their edges, and then vulcanisod; the joining of the sheets is effected, by preferenbe, by cutting the two sheets together, so that the joint may not be thicker than any other portion of the article. In this manner a cap is made suitable for fitting over the front part of the sole and upper of a shoe or boot. The portion which passes over the top of the foot is of such a size as to completely protect the front of the upper of the shoe or boot from wet and dirt, and the portion which passes over the sole of the shoe or boot extends as far as the waist or centre portion thereof beyond the tread, and there it fits perfectly close, so as to prevent mud working in between the sole of the shoe or boot and the under surface of the mocassin. This perfect fit is ensured by making the open end or mouth of the cap smaller than the part of the foot which it is to fit, so that it may require stretching in putting it on; its elasticity allows it to stretch freely, and causes it also to clasp the foot closely. The mocassin is secured to the foot by means of strings or straps attached to it at the centre of the upper part or portion, and which the wearer of the article ties or buttons round the ankle. *Patent abandoned.*

1037. W. FOX. *Improvements in the manufacture of brooms and brushes.* Dated April 10, 1862.

For the purpose of this invention flat steel wire, or narrow strips of thin sheet steel, are used in a hardened and tempered state. These steel wires or steel strips are fixed together and to a suitable head or block. *Patent completed.*

1038. A. TRIMEN. *The protection and solidification of magnesian limestone and other stones, and for the prevention of the passage of water through the same.* Dated April 10, 1862.

This consists in issuing certain lacs in naptha or spirits, reducing the same to a fluid state, and filling the pores and coating the surface of the stone therewith. *Patent abandoned.*

1039. H. HOLLAND. *Improvements in manufacturing the stretcher points of umbrellas and parasols.* Dated April 11, 1862.

The patentee claims, first, in improvements in manufacturing the stretcher joints of tubular steel ribs for umbrellas and parasols, viz., constructing with each tubular rib a steel flange, which is hardened and tempered with the rib, and afterwards covered with brass; second, in manufacturing the stretcher joints of solid steel ribs for umbrellas and parasols, viz., compressing and flattening out from each steel wire intended for a rib flange, and afterwards hardening and tempering such steel wire rib length with such flange, and covering the flange with brass. *Patent completed.*

1040. J. T. GRICE. *Improvements in the manufacture of twisted metallic tubes.* Dated April 11, 1862.

The patentee claims filling the tube to be twisted with a yielding substance, either solid or in powder, or inserting in the tube to be twisted a small solid mandril of steel or other hard substance, for the purpose of preventing the irregular yielding of the tube during the twisting process. *Patent completed.*

1041. E. H. CARBUTT. *Improvements in pistons.* Dated April 11, 1862.

This relates to a peculiar construction of piston, suitable for all purposes where ordinary pistons are now used, and consists in making such pistons of corrugated cast steel, whereby considerable lightness, combined with strength, is obtained. *Patent abandoned.*

1042. J. GARNETT. *Improvements in apparatus for washing photographic pictures.* Dated April 11, 1862.

This consists in the use of a shallow box, perforated on its upper and under side, into which box the prints or pictures requiring to be rinsed or washed are deposited, suitable divisions being placed in the box to separate the different sizes of prints, which divisions or partitions are made moveable to suit different sizes. The box with the photographs therein is placed inside a convenient reservoir of water, and a vertical motion is imparted to the box whilst submerged by a handle or other suitable device, so as to cause the water to flush alternately through the top and bottom perforations in the box, and thereby effectually rinse the pictures on both sides. *Patent abandoned.*

1043. W. E. GEDGE. *An improved lamp for lighting mines.* (A communication.) Dated April 11, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1044. J. F. MATHIAS. *An apparatus for pressing and ironing straw hats of any shape or form.* Dated April 11, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1045. F. RIGOLLOT. *Improvements in machinery or apparatus for manufacturing riveting pegs for boots and shoes and other pins or pegs.* Dated April 11, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1046. J. M. LAUDMAN. *Improvements in hydraulic engines.* Dated April 11, 1862.

This invention is not described apart from the drawings. *Patent abandoned.*

1047. T. KNOWLES, J. HOUGHTON, W. KNOWLES, and W. HOUGHTON. *Improvements in looms for weaving.* Dated April 11, 1862.

Here, to avoid reversing the loom, the inventors apply a catch box and apparatus or mechanism so arranged as to temporarily disconnect the lathe or going part of the loom from the different apparatus which gives motion to the shuttle boxes, and the jacquard engine, or the apparatus by which they are actuated, that they can be turned back simultaneously by hand whilst the going part of the loom remains stationary, by which they can readily put all the parts right, or in proper relative position again. *Patent abandoned.*

1048. E. BUTTERWORTH. *Improvements in machinery for applying adhesive substances to preserve the form of cops of yarn.* Dated April 11, 1862.

This is applicable to that class of machinery known as mules or twiners, and consists, 1, in traversing the box that carries the adhesive substance in front of the spindles by a band or other means, which is driven from some convenient part of the machine. 2, In stopping the box when it has got as far as required by self-acting apparatus. 3, In constructing the box so that, when required, the adhesive substance will not run out of it. 4, In making the paste box so that more or less of the adhesive substance can be let out as required. *Patent completed.*

1049. W. CLARK. *Improvements in the manufacture of leathern accoutrements.* (A communication.) Dated April 11, 1862.

This relates to the employment of metal fastenings for uniting leather, such as for military or civil accoutrements, in place of the threads of vegetable material hitherto used for sewing the different parts together. The fastenings employed may consist of screws or rivets of copper wire or other metal. *Patent completed.*

1051. J. H. JOHNSON. *Improvements in firearms.* (A communication.) Dated April 11, 1862.

This relates more particularly to that class of firearms in which the distance between the sights is considerably longer than the length of the barrel, and consists, firstly, in certain improvements in the existing arms of this description; and, secondly, in a novel construction and arrangement of the arms of the class referred to. We cannot here quote the details of the invention. *Patent completed.*

1052. J. HOWARD, E. T. BOUSFIELD, and T. PHILLIPS. *Improved apparatus applicable to steam cultivation.* Dated April 11, 1862.

The patentees claim, first, regulating the giving off of the slack rope of windlasses by friction gearing, in the manner described. Secondly, ensuring the automatic traverse of the anchor by the action of the taut or slack rope, in the manner described. Lastly, mounting the pulley or roller of rope porter on a rocking bar or its equivalent, for the purposes described and set forth. *Patent completed.*

1053. J. WHITESMITH. *Improvements in power looms and in pirn winding apparatus.* Dated April 11, 1862.

This invention is not described without reference to the drawings. *Patent completed.*

1054. J. BUNNETT. *Improvements in revolving shutters and in machinery for producing the same.* Dated April 12, 1862.

These shutters are so constructed that they can also be used as venetian blinds. For this purpose such lath is mounted on a central axis, which moves up and down in the grinding shutter grooves. The upper edges of the laths are connected together by hinged flaps. A portion of the inner side of each shutter-pivot turns on pivots, and when it is desired to use the shutter as a venetian blind, this limb of the groove is turned a quarter round, when the laths are free to turn on their axes, and may be set at any required inclination. The winding pulley for raising and lowering the shutter is fitted with a friction wheel or brake, which is brought into action on lowering the shutter, but runs free when the shutter is being wound up. In order to give the required curve to the edges of the shutter-laths, a bending machine is used, by which both edges of the lath are simultaneously bent to the proper form by dies acted upon by cranks or eccentrics actuated by steam or other power. *Patent completed.*

1055. W. NUSSEY. *Improvements in machinery or apparatus for preparing and combing wool, flax, hair, cotton, silk, and other fibrous materials.* Dated April 12, 1862.

This invention is carried into effect as follows:—Firstly, the patentee employs an oscillating "feeding head," in connection with a circular or other suitable "passing comb," such oscillating head being provided with two or more nippers, or two or more pairs of rollers, or other suitable holders, which are so arranged as that each nipper or other holder may be pressed upon by a separate spring or springs; or they may be pressed upon jointly. The nippers or holders are so constructed and arranged that they can pass over the passing comb, and deliver the cleaned end of the fibres beyond the same, and as they recede leave the uncleaned ends, and noil in the passing comb at each successive stroke of the oscillating head, the latter having a rising and falling motion, as well as a forward and backward motion, imparted to it by suitable mechanical means. Secondly, he employs on the other side of the passing comb, or that furthest from the oscillating head, a comb or combs to receive the cleaned ends of the fibres which project beyond the passing comb straight and full length into the pins or teeth of the said comb or combs, such comb or combs having a rising and falling motion imparted thereto, the teeth or pins passing through a plate perforated with holes to suit (or thin bars or blades may be passed between the teeth), in such a manner that, when the comb or combs fall down, the pins or teeth fall out of the fibre and allow the latter to be carried forward by the passing comb, when the comb or combs again rise up to receive the cleaned ends of the succeeding fibres as before described. The comb or combs may also be allowed to travel a short way with the passing comb before falling down out of the fibres, and to return to the original position before rising. Or, instead of a rising and falling comb, an endless sheet or chain comb may be employed, having bars or strips of steel between each row of teeth. *Patent completed.*

1056. E. BULLEE. *A new hydraulic ram.* Dated April 12, 1862.

This consists in a method of constructing or arranging hydraulic rams, whereby the liability of the clack breaking is avoided, and the rams enabled to work even in high water. The details of the invention ate voluminous. *Patent abandoned.*

1057. A. SWEET. *Certain improvements in locks and latches.* Dated April 12, 1862.

This consists—1, in the employment of locks or latches constructed with levers or tumblers of a toothed pinion (or other equivalent arrangement), the teeth of which take into corresponding teeth or indentations formed in, or attached to, the tumblers or levers, one by one, into the position necessary for allowing the "stump" or pin (formed with or attached tt the bolt) to pass, prevent the picking of the lock by pressure, as practised with other locks. 2, In the use of a drum or tube capable of revolving on the key. This drum or tube is formed with a flat side, or other equivalent figure, which, when presented to the tumblers or levers, allows of the bolt being drawn backward from within the door to which the lock is attached without the use of a key, but which, when it is attempted to pick the lock from without, is turned away from the tumblers or levers, and prevents the drawing bach of the bolt until the tumblers or levers are raised by the proper key into a position, which brings a series of notches cut in them opposite to the stump or pin formed with or attached to the bolt, and allows of its being drawn backward (as the drum is partially revolved by the key) by a "false bit" or projection attached to and moving with the drum. In combination with this arrangement, the inventor makes use of a shield or guard plate, which prevents the introduction of a picklock for effecting the withdrawal of the bolt. 3, In an arrangement for affording additional security in locks wherein the bolt is withdrawn by means of a handle. 4, In a new permutation key, the bits of which are all of one length, and are capable of being set at various angles, so as to obtain the different amounts of lift required to operate upon the several levers or tumblers of the lock. *Patent abandoned.*

1058. E. DREWETT. *Improvements in bottles and other vessels whereby to separate and retain sediment from their contents.* Dated April 12, 1862.

According to these improvements in bottles for filtering or separating sediment from their contents, the patentee makes the bottles with a double bottom, or with a false bottom, to apply and fit closely in the bottom of the bott'e to form a chamber below it. It should fit air-tight. He makes the inner bottom of the bottle inclined instead of horizontal, as usual when the bottle stands upright, and at the lowest point (at the side of the bottle), he makes an opening into the chamber below. Instead of being a simple opening, the communication may be made with a short bent pipe passing outside of the bottle. In a bottle so constructed, sediment allowed to settle in the contents of the bottle will pass through the opening into the lower chamber, and there deposit. When sediment is so deposited, by holding the bottle in a particular position or positions, the contents of the bottle may be decanted, and the whole of the sediment retained in the lower chamber. Baths used for photographic purposes, are constructed in a similar manner, that is to say, with a double bottom, either formed of a piece with the bath, or a loose bottom fitted thereto, the inner bottom being inclined and in communication at the lowest point (at one side of the bath), for the separation of the sediment from the contents of the bottle, as before explained with reference to the bottles. *Patent completed.*

1059. A. S. CAMPBELL. *Improvements in surface condensers.* Dated April 12, 1862.

This invention relates to the condensing of the waste steam from steam engines. This effect is produced with the expenditure of a comparitvely small quantity of water, by means of the cold produced by rapid evaporations. The apparatus by which the invention may be carried out, in an economical and effective manner, consists of a number of condensing tubes, fitted at each end into a plate forming one side of a chamber, into one of which chambers opens the exhaust or steam pipe, whilst from the other or opposite chamber leads the condensed water pipe. The whole is made to rotate over a reservoir of cold water, so that the tubes will be successively immersed, and the cold produced by the evaporation of the water outside the tubes, as they rotate, effects the desired condensation of the steam. *Patent abandoned.*

1060. A. S. CAMPBELL. *Improvements in refrigeration of liquids.* Dated Apiil 12, 1862.

This consists in the use of a number of horizontal tubes fitted at each end into a plate forming one side of a chamber, into one of which chambers the liquid to be cooled enters, whilst from the other or opposite chamber the cooled liquid passes out. The whole is made to rotate over a reservoir of water, so that the tube will be successively immersed, and the cold produced by the evaporation of the water outside the tubes effects the desired refrigeration of the liquid within them. *Patent abandoned.*

1061. J. PARK. *Certain improvements in or applicable to steam engines.* Dated April 14, 1862.

The first part of this invention is chiefly applicable in works where several steam engines are employed, and it consists in connecting, by suitable pipes, the whole or any number of such steam engines to one condensing apparatus. By this means each steam engine can be worked as a condensing engine, while the construction remains simple, a in high-pressure engines. The second part of the invention is particularly applicable to the steam engines coupled direct to the rag machines employed in the manufacture of paper pulp, as described in the specification of letters patent granted to the present patentee on the 24th day of May, 1855 (No. 1,170), and consists in applying a condenser and air-pump to such engines, and in casting or otherwise making a jacket round the cylinders thereof into which the waste or exhaust steam is conveyed for keeping the cylinder warm. *Patent completed.*

1062. E. PEYTON and W. F. BATHO. *Improvements in angle iron applicable to metallic bedsteads, roofs, bridges, and other similar purposes.* Dated April 14, 1862.

Here the patentees roll or otherwise manufacture angle-iron with corrugations, by which they give it additional strength or stiffness, and are thus enabled to use a lighter bulk of metal than at present, thus combining strength with lightness of material, and giving an improved appearance to the object constructed with it, such as metallic bedsteads, roofs, bridges, and similar constructions. *Patent completed.*

1063. J. F. SPENCER. *Improvements in steam engines.* Dated April 14, 1862.

The patentee claims, in surface condensing steam engines, the combination of the fuel and condensing water pump in or within one chamber or barrel, and whether such pump be horizontal, vertical, or inclined. 2. In inverted cylinder

surface-condensing engines, the implement of a cross-head attached to the main piston or pistons by two or more rods, and connected direct at one or both ends to the buckets of one oi two combined pumps, or to one single feed and one single-acting condensing water pump, in the manner and for the purposes described. *Patent completed.*

1064. H. C. Lee. *Improvements in knitting machines.* Dated April 14, 1862.

This invention has reference to knitting machines in which sliding hooked spring needles are employed, and its objects are simplicity of construction, and the production by the machine, and with a series of needles of one gauge, of a greater variety of work than has heretofore been accomplished by machines of this class under similar conditions. The inventor employs needles, having the bend of the hook made larger than usual, so as to allow the thread or yarn to be drawn through them, and to be crimped (as described), instead of by means of jack sinkers or combs, or other ordinary appliances for taking off sufficient thread or yarn to form the loops, and laying it in proper position for the formation of the next series of loops. This operation he effects by constructing the machine with a travelling yarn carrier or thread guide, and with a travelling presser, both stationary in respect of the length or sliding movement of the needles, and with a series of stops between the needles to hold back the thread, according to the distance that the needle shall be depressed or passed beyond the stops. He produces the sliding movement of the needles by inclined surfaces in a groove or otherwise, as heretofore, but he regulates the degree of such movement by an adjustable cam in the line or path of the inclined surfaces. Instead of the ordinary presser for closing the needles, he uses a travelling rotary bar presser, which receives its motion from contact with the needles, acts as a fair leader to the thread or yarn, and by having the special peculiarity of inclined surfaces between its teeth, or between some of them, closes the needles, or some of them, accordingly as such surfaces are arranged. *Patent abandoned.*

Erratum.—No. 974 in our last No. was "completed," and not "abandoned."

PROVISIONAL PROTECTIONS.

Dated July 25, 1862.

2110. H. A. Jowett, Sawley, Derby, civil engineer. Improvements in obtaining motive power, and in transmitting the same from place to place, and in apparatus connected therewith.

Dated September 11, 1862.

2500. J. Hemsley, Melbourne, Derby, manufacturer. An improved fabric or material for scarfs, ties, handkerchiefs, and neckerchiefs.

Dated September 18, 1862.

2556. L. Mond, 38, Sidney-street, Brompton. An improved method of obtaining hypo-nitric acid and nitric acid from nitrate of soda.

Dated October 13, 1862.

2752. A. F. Gallis, 71, Dean-street, Soho. A new method of covering street omnibuses and vehicles of every description for the purpose of sheltering passengers travelling on the top of the same.

Dated October 15, 1862.

2779. J. Taylor, Oldham, cotton spinner. Improvements in temples for looms.

2781. C. De Bergue, Strangeways' Works, Manchester, engineer. Improvements in the permanent way of railways.

2782. W. Pope, Cornwall-road, Lambeth, gentleman. Improvements in coating the sides of ships, batteries, forts, or other places with defensive armour plates.

2783. P. Potenza, Naples, commander. The extraction, preparation, and spinning of the silky fibre contained in the bark of mulberry trees, and the manufacture of the same into textile fabrics.

2784. J. B. G. M. F. Piret, 29, Boulevard St. Martin, Paris, civil engineer. Improvements in lubricating apparatus.

2785. F. F. Prud'homme, 51, Rue de Malte, Paris. Improvements in machinery or apparatus for raising water.

2786. J. Bapty, Leeds, woollen yarn manufacturer. Improvements in apparatus for preparing wool and other fibrous materials.

2787. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in felting machines, applicable also to the fulling, scouring, and dressing of pure and mixed woollen stuffs. (A communication.)

2789. E. A. Cowper, Great George-street, Westminster. Improvements in steam engines.

Dated October 16, 1862.

2790. W. Barningham, Pendleton Iron Works, Manchester, iron manufacturer and engineer. Improvements in the permanent way of railways.

2792. G. T. H. Pattison, Glasgow, finisher. Improvements in machinery or apparatus for embossing or finishing woven fabrics.

2793. G. T. H. Pattison, Glasgow, finisher. The imparting of an improved surface or appearance to fabrics woven with mixed materials.

2794. H. A. Remière, 52, Rue de l'Arbre-sec, Paris, harness maker. An improved horse collar.

2796. T. G. Harold, Brooklyn, New York, America. Improvements in locks.

2797. E. Humphrys, Deptford, engineer. Improvements in steering apparatus.

2798. H. Ransford, Huron Lodge, West Brompton. Improvements in building ships and other vessels.

2799. J. and J. Cash, Coventry, manufacturers. An improvement in the manufacture of valentines.

2800. J. Robinson, East India-road, surveyor. Improvements in protecting the submerged portions of iron ships, and in ventilating the cabins and cabin decks in iron ships.

2801. H. Hely, jun., Merchants Quay, Dublin, envelope manufacturer. Improvements in envelopes.

Dated October 17, 1862.

2805. J. Davis, Tipton, iron founder and engineer, and G. Davies, Tipton, ironfounder and engineer. Improvements in rotary engines, rotary pumps, and rotary blowing machines.

2806. W. S. Kennedy, Queen's-road, Bayswater. An improved method of, and apparatus for, applying fomentations and other external remedies to the throat.

2807. G. T. Bousfield, Loughborough Park, Brixton. Improvements in the manufacture of iron and steel. (A communication.)

2808. J. H. Johnson, 47, Lincoln's-inn-fields, gentleman. Improvements in the prevention or removal of incrustation in or from steam generators. (A communication.)

Dated October 18, 1862.

2809. R. Webster, Leeds. Improvements in means or apparatus for preventing or mitigating accidents arising from collisions of railway trains.

2810. E. Lord, Todmorden, machine maker. Certain improvements in machinery for opening and cleaning cotton and other fibrous substances.

2811. H. Ledger, Manchester, builder, and B. Williamson, traveller. An improved substitute for tombstones, tablets, monuments, and other similar memorials or commemorative records.

2812. J. Bentley, Denton, Lancaster, hat manufacturer. Im rovements in apparatus for forming and pressing felt hats.

2813. R. Lauth, Reichshoffen, France. Improvements in machinery or apparatus for polishing sheet iron or other metal.

2814. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in frames for doubling and twisting threads. (A communicacion.)

2815. J. Fuller, Bishopsgate-street, telegraph engineer. An improvement in treating india rubber used on a wire or wires for insulating the same.

2817. W. Clark, 53, Chancery-lane, engineer. Improvements in apparatus for dredging. (A communication.)

Dated October 20, 1862.

2818. J. Tangye, Birmingham, manufacturer. Improvements in or additions to certain kinds of pulleys for raising heavy weights.

2820. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in transferring designs and prints produced by photography to stone or zinc. (A communication.)

2824. J. B. Payne, Chard, Somerset, engineer and lace manufacturer. Improvements in machinery for the spinning, twisting, and doubling and laying of hemp, flax, and other fibrous substances.

2826. J. H. Johnson, 47, Lincoln's-inn-fields, gentleman. Improvements in apparatus for boiling liquids and cooking or preparing food, applicable also as a night light. (A communication.)

Dated October 21, 1862.

2830. J. Byram, Moldgreen, near Huddersfield, tinner, brazier, and ironmonger. Improvements in lamps for the combustion of paraffin, rock oil, or other oils.

2832. C. G. Clarke, Owthorn, near Hull. Improvements in garden shears.

2834. J. T. Cooke, Leicester, batten maker. Improvements in battens for weaving.

2836. G. T. Bousfield, Loughborough Park, Brixton. Improvements in the manufacture of boots and shoes. (A communication.)

2838. G. Haseltine, 100, Fleet-street. Improvements in the mode of, and in machinery for, manufacturing nails, brads, and other similar articles. (A communication.)

Dated October 25, 1862.

2872. J. Carpendale, Meadow-street, Sheffield, britannia metal smith. Improvements in the means of producing raised chasing on britannia and other compressible metals.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

1828. F. E. Schneider, and J. Snider, jun. Breech-loading fire-arms.

1848. R. Cook. Pianoforte actions.

1849. A. Ripley. Governors or regulators.

1851. T. Carr. Machine for grinding, kneading, washing, and other like purposes.

1869. G. Turner. Applicable to machines for grinding coffee and spices.

1876. J. Parkes. Gas lanterns.

1878. J. Martin. Reaping and mowing machines.

1880. J. H. Johnson. A new composite fluid. (A communication.)

1882. J. Watson. Printing machines.

1888. R. A. Brooman. Preparing paper for the reception of photographic pictures. (A communication.)

1902. J. Petrie. Slide valves.

1922. J. M. Dunlop. Cotton gins.

1950. R. A. Brooman. Hollow plates for hydraulic presses. (A communication.)

1951. O. F. Byström. Pyrometer.

1985. H. Kellogg. Breech-loading firearms and cartridges.

2002. C. E. Green. Breech-loading firearms.

2009. J. H. Johnson. Machinery or apparatus for washing ores and minerals. (A communication.)

2120. E. Tysall. Manufacture of forks.

2126. R. Low and W. Duff. Producing an adjustable pressure on certain parts of machinery.

2130. W. Spence. Improvements in the preparation of a red colouring matter. (A communication.)

2132. W. Spence. Improvements in the preparation of a blue colouring matter. (A communication.)

2571. J. B. Giertz. Gas burners or jets.

2620. P. Wright. Parallel vices.

2655. J. Wright. Rotative travelling crane. (A communication.)

2706. J. Oxley. Expressing and separating beer from yeast or barm.

2751. G. and A. Harvey. Boring machinery.

2756. C. Thomas. Manufacture of silicate of soda or silicate of potash, and in the manufacture of artificial stone.

2762. F. G. Grice. Manufacture of nuts for screwed bolts.

2789. E. A. Cowper. Steam engines.

2811. H. Ledger, and B. Williamson. Substitute for tombstones.

2836. G. T. Bousfield. Manufacture of boots and shoes. (A communication.)

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed October 31, 1862.

1287. J. Swallow, and J. Allinson.
1289. C. P. A. Douchain.
1291. W. and T. Huntington.
1299. R. A. Brooman.
1300. C. F. Whitworth.
1301. M. Paul.
1307. H. Juhel.
1309. E. Ormerod, and C. Schiele.
1311. J. M. Herdevin, and J. A. Jullien.
1312. T. Snowden.
1314. E. Herdman, A. F. Herdman, and J. Herdman.
1321. J. and T. Mellodew, and C. W. Kesselmeyer.
1323. J. Heyworth.
1325. A. Williams.
1327. L. G. Perreaux.
1331. T. F. R. Brindley.
1335. R. Burley.
1337. J. Roscoe.
1341. J. Adcock.
1344. R. Mills.
1345. A. Morel.
1347. P. Chenaillier.
1348. J. Clarke, and J. Richmond.
1349. W. and J. Richard.
1351. W. Greaves.
1353. W. Clark.
1355. J. E. Ransome, W. Copping, and L. Lansdell.
1358. E. Bourdon.
1359. C. V. F. De Berville.
1360. P. H. Colomb.
1365. J. Johnson, and A. Chapman.
1367. R. A. Brooman.
1368. J. Combe.
1369. G. T. Bousfield.
1372. D. Marchal, and A. C. de Wiart.
1373. J. McCann.
1382. G. C. Grimes.
1385. Leo de la Peyrouse.
1389. L. D'Aubreville.
1390. T. K. Mace.
1400. G. C. Haseler.
1440. J. H. Johnson.
1413. W. Clark.
1455. H. Deacon.
1461. A. Nicole.
1466. J. P. Jouvin.
1467. J. Dicker.
1484. A. A. Lamiable.
1492. F. Stocken.
1598. J. Simpson.
1607. J. H. Johnson.
1624. F. Datichy, and E. Sabatier.
1699. P. M. Parsons.
1888. C. Cochrane.
2176. W. E. Newton.
2328. C. Callebaut.
2380. W. E. Newton.

Sealed November 4, 1862.

1378. W. Southwood.
1381. C. Lungley.
1394. T. Fawcett.
1398. F. J. Bolton.
1399. F. J. Bolton.
1412. J. B. Cristofine.
1414. H. W. Sambridge.
1432. S. B. Ardrey, and S. Beckett.
1438. A. Wormull.
1448. R. M. Latham.
1480. G. Haseltine.
1488. G. Davies.
1535. A. Giles.
1547. A. B. Childs.
1574. J. A. C. N. Delpech.
1594. G. H. Daw.
1801. W. E. Newton.
1955. J. Kidd.
2172. J. and E. Ransom.
2174. G. T. Bousfield.
2412. J. G. N. Alleyne, and J. Roberts.
2413. J. Nickson, and T. Waddingham.
2526. A. V. Newton.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2478. I. Brown.
2483. R. A. Brooman.
2487. L. Pohl.
2503. C. W. Siemens.
2491. J. Jones, jun.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2427. H. E. Drayson.
2451. R. Cook.
2414. W. Hartley.
2419. W. Naylor.
2430. T. S. Grimwade.
2450. J. Patterson.
2452. W. Staufen.
2484. T. Thomas.

LIST OF SPECIFICATIONS PUBLISHED

For the Week ending October 25, 1862.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s. d.		s. d.		s. d.		s. d.		s. d.		s. d.
770	0 8	787	0 4	804	0 4	821	0 6	838	0 4	855	0 4
771	0 4	788	0 8	805	0 8	822	0 8	839	0 4	856	0 6
772	0 4	789	0 10	806	0 8	823	0 4	840	0 4	857	0 4
773	0 8	790	0 4	807	1 6	824	1 8	841	1 6	858	0 4
774	0 6	791	0 4	808	0 6	825	0 4	842	0 8	859	0 10
775	0 6	792	0 8	809	0 4	826	0 4	843	1 2	860	0 4
776	0 4	793	0 8	810	0 8	827	0 4	844	1 4	861	0 4
777	1 0	794	0 8	811	0 4	828	0 10	845	0 4	862	0 4
778	0 10	795	0 8	812	0 4	829	0 10	846	0 4	863	1 4
779	0 4	796	0 4	813	0 10	830	0 4	847	0 6	864	0 4
780	0 4	797	0 10	814	1 10	831	0 8	848	1 0	865	0 10
781	0 4	798	0 10	815	0 4	832	0 8	849	0 4	866	0 10
782	1 6	799	0 8	816	0 4	833	1 4	850	0 4	867	0 4
783	0 8	800	0 4	817	0 4	834	0 4	851	0 4	868	0 4
784	0 4	801	0 4	818	1 0	835	0 10	852	0 4	869	1 0
785	1 4	802	0 4	819	0 4	836	0 8	853	0 4	870	0 8
786	0 4	803	0 4	820	0 4	837	0 4	854	0 10		

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THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, NOVEMBER 14, 1862.

THE FOREIGN LOCOMOTIVES IN THE INTERNATIONAL EXHIBITION.

THE locomotives in the western annexe have as yet remained comparatively untouched in the universal devastation going on round about them, and they yet stand up like so many antediluvian monsters in the midst of a surrounding chaos. Amongst these twenty engines, nine are from the continent, namely, three from France, four from Germany, one from Belgium, and one from Italy; and some of these latter have had to undergo some rather severe criticism at the hands of English engineers. There is no doubt that these foreign engines contrast unfavourably with the severe simplicity that characterises most of our own productions in this line.

It appears to us, however, that English engineers have not fully taken into account the very different circumstances existing on the continent. Fuel is almost everywhere very much dearer and inferior than with us. Some continental countries have even to fetch all their coal from England. For instance, English coal competes, for some purposes, with German lignite, as far up the Elbe as Prague. Economy of fuel cannot be obtained without some complication and additional details. On many of the foreign lines, particularly in France, the engine-drivers are allowed a percentage upon any saving of fuel they may effect. They are thus more willing than our engine-drivers to adopt any improvement, even if that improvement should involve additional trouble. Many an engineering novelty, in the workshop as well as on the line, has, in England, been "burked" by the unwillingness of the "hands."

Capital being very dear with the continental nations, their lines have been laid out witn the least possible first cost. Steep inclines and curves of a small radius, the abominations of the Stephensons, have for this, among other reasons, been brought into their railway practice. Heavy engines, their weight giving adhesion for the steep inclines, with arrangements to pass round the sharp curves, have thus been necessitated; Robert Stephenson's plan of using two four-wheeled engines, coupled back to back, being rejected on account of the expense in fuel of this arrangement. The cost of manufacture and repairs involved in additional complication is not so much felt with them, as a good fitter does not get more than a labourer with us; indeed, in some districts, not so much. Time is not worth so much money on the continent as in England, and thus the passengers and mails are not required to be propelled with English speed. The "paternal governments" also having made exclusive monopolies of the railway lines, have prevented all competition. As long as the subjects of these Governments do not interfere with politics, very great care is taken with the necks of the loyal lieges, and decisions about accidents are not left to the caprice of a jury.

The slower speeds thus permitted to these railway companies allow of somewhat more complication than could stand the wear and tear that the English locomotive engine has to undergo; for it is "pace" that kills the iron horse, as well as his flesh and blood prototype. English and continental railway practice can scarcely be compared, they are so different. One difference would, perhaps, touch the heart of some English shareholders, and that is the high dividend of many continental lines. These dividends are shared in many cases with all the employés, from the highest manager to the lowest engine-driver. If railway directors were always paid in proportion to the profits, perhaps railway property would become more valuable than it generally is in England. Perhaps, also, it may be wholesome to our insular pride to remember that some of the most important improvements made in locomotives since 1851 have been imported from abroad. We owe the introduction of Giffard's injector to France. Bogies and trucks are American improvements. We still fetch our steel tyres and steel cranked axles from Prussia, the latter to meet our persistent adherence to inside cylinder engines. This expensive form of engine has been abandoned for several years in Germany and America. Having at last settled down to some simple coal-burning schemes, we find out that the Americans have preceded us in this improvement in locomotive practice, and we no longer attempt to burn coal by building up coke ovens inside our fire-boxes.

The light pistons, so much used now for locomotives, are of Swedish origin; Mr. Ramsbottom, of Crewe, having designed his well-known piston after a Swedish model. Abroad, this piston is generally known under the name of the Swedish piston. We may sneer at the Austrian 4-cylinder express engine, for its complication, but after all it is the only locomotive engine in the Exhibition perfectly counterbalanced for all speeds. An important improvement, of English origin, invented since 1851, is Mr. Ramsbottom's scoop for feeding a tender while in rapid motion. The action of this device may, perhaps, be shortly explained, by terming it a centrifugal pump with an infinitely large radius. The engine and tender, from the Crewe shops of the London and North Western Railway, embodying this arrangement, and those close by of Messrs. Berger, Peacock, and Co., of Gorton, near Manchester, may be looked upon as the *élite* of the locomotives in the western annexe. These two illustrate, in a remarkable manner, the general difference between engines issuing out of private workshops, and those made in railway companies' workshops. The Gorton exhibit is the very embodiment of locomotive beauty and simplicity. Every curve about it has evidently been made a special study, and has been carefully worked out on paper before being carried out in the shop. Almost every detail is the most simple that could be chosen for its particular function, and they have all been put together with the most perfect regard for symmetry.

The driving wheels are 7 ft. in diameter, and the leading, trailing, and tender wheels are 3 ft. 9 in. in diameter. The total length of wheel-base is 15 ft. 4 in., and it is equally divided on each side of the driving-wheel. The cylinders are 16 in. in diameter, 22 in. stroke. There are bearings inside for the crank axle, and outside bearings for the two others. The fire-box, of copper, is 4 ft. 3 in. long, 4 ft. 3 in. wide, and 5 ft. 9 in. deep. The boiler is 4 ft. 2 in. in diameter, with 215 2-in. diameter tubes, 11 ft. long. These dimensions give 18 square feet of grate surface, 96 square feet of fire-box surface, and 1,236 square feet of tube surface; the total heating surface being therefore 1,332 square feet. The 6-wheeled tender holds 1,750 gallons of water and 1½ tons of coal. The engine, when full, weighs 28 tons 6 cwt. The fire-box is arranged to burn coal, there being placed within it a deflecting plate or hood, causing the cold air from the fire-box to impinge upon a fire-brick arch thrown across the fire-box. The firedoor itself is of the "Midland" kind, the links and handles working the two slides being of a rather heavy pattern. This inside cylinder engine is intended for Portugal—the Portuguese guage, 5 ft. 6 in., giving ample room for the arrangement of the working parts. The link motion used is Allen's straight link. We suppose that the only impediment to the universal introduction of this elegant and light form of the link motion is the royalty to be paid for its use, as we believe that the patent for it is not yet expired. As far as we could tell by an outside inspection, there did not appear to be the slightest originality or novelty about this engine.

It seemed to us to stand there and to say: "Locomotive practice has reached its culminating point, and I embody its highest perfection." Is this the case? We very much doubt it, and we believe that another decade will witness some great changes in this direction also. It is not very easy for a private locomotive maker to advance locomotive practice. He does not see the locomotive at its work. He does not know all the requirements of a railway line. He does not "walk the "hospitals" of the repairing shop. All that he can do has been achieved in this Gorton engine. Practical mechanics are so much of an experimental science, that if a private manufacturer were to try new arrangements, he would, probably, very soon scheme himself out of all his custom. Accordingly, we see that most of locomotive improvements in detail, of late years, have been introduced by the engineers of companies. Whether these experiments, sometimes resulting in successes and as often or oftener in failures, have in all cases been carried on in a perfectly fair way as regards the interests and dividends of the railway companies, we will not at present inquire.

The Crewe engine is literally an embodiment of unimpeded progress, as one of the 170 similar ones in use on the London and North-Western Railway has run the distance of 131 miles without stopping. The different details about this engine and tender, such as the picking-up scoop, the duplex safety valve, the flush boiler, the pistons, the cylinder lubricating apparatus, the screw reversing gear, the coal-burning arrangement, the communication between guard and engine-man, render it the most complete engine in the whole annexe. The driving wheels are 7 ft. 7½ in. in diameter, the leading and trailing wheels only 3 ft. 7½ in. The wheel base is 15 ft. 5 in., 7 ft. 7 in. between the leaving and driving, 7 ft. 10 in. between driving and trailing wheels, 9 ton 8 cwt. are on the leading, 10 ton 10 cwt. on the driving, and 6 ton 2 cwt. on the trailing wheels when the engine is full. The outside cylinders are 16 in. in diameter, and 24 in. stroke. The grate surface is 14½ square feet. The fire-box heating surface is 85 square feet, that inside the 192 tubes 915 square feet, making up a total of 1,000 square feet. The tender carries 1,500 tons of water and 2 tons of coal. The boiler is fed with two Giffard injectors, No. 10 size, no other feed apparatus being used. The fire-box is arranged for burning coal, the air being admitted through two openings in front, and deflected on to the fire by a brick arch across the fire-box. This is regulated by the engine-man by means of dampers. There is a hopper in the smoke-box to receive any particles of unconsumed fuel that may be carried through the tubes. They

are discharged through an opening in the bottom of the hopper.

The screw reversing gear has, no doubt, several advantages over the ordinary reversing lever, but in case it be required to reverse the engine very suddenly, as, for instance, to avoid a threatened collision, we do not see that this could be done so quickly as with the ordinary reversing gear.

We will now try to describe some of the foreign engines exhibited. They will, no doubt, contrast unfavourably in many respects with the above two English express engines, but, as we explained before, the different circumstances under which they were manufactured, and are to be employed, must be taken into consideration. The Northern Railway Company of France send an eight-wheeled coupled goods tank engine, burning coal. It was made by Messrs. Ernest Gouin and Co., after the designs of M. Jules Petiet, engineer of the railway company, who have also sent the drawings of two other engines, one being a ten-wheeled passenger, the other a twelve-wheeled goods engine, both with four cylinders.

The company have printed a small pamphlet, intended for the use of the Jury, called "Notice sur les trois types de Locomotives Exposées," from which we extract the principal part of the following account of these very remarkable engines. They style the engine exhibited "Le Dromadaire," and it certainly is a very ugly animal. Without completely subscribing to all the opinions therein contained, we believe that it will be found an interesting exponent of French locomotive practice:—

In the locomotives exhibited, the fire-box is placed above the wheels and frame plates, thus affording the means of giving it a much greater width (5 ft. 9⅞ in. and 5 ft. 10⅞ in.) By doing this a greater number of tubes may be placed in the boiler, and a larger surface of grate obtained without lengthening the boiler. It is obvious that, for the combustion of fuel of inferior quality, the area of the grate must be increased. The fire-grates of these locomotives are all made according to the plan patented by M. Belpaire.* Eleven locomotives, similar to the one exhibited, are working very successfully on the Northern line, and burn only slack coal. This one has a fire-grate 4 ft. 10 in. by 5 ft. 9⅞ in., equal to 28.20 square feet. The four cylinder passenger and the four cylinder goods engine have respectively a fire-grate surface of 4 ft. 10 in. by 5 ft. 9⅞ in. equal to 28.20 square feet, in the first case, and 6 ft. ¾ in. by 5 ft. 10⅞ in., equal to 35.84 square feet, in the other. The roof of the fire-boxes of these engines, like the sides of ordinary fire-boxes, is formed of two parallel plates held together by stay-bolts. The lengths of the tubes are 11 ft. 5¾ in., with an outside diameter of 1 37-64 in. This small diameter allows us to reduce the average thickness of metal to 1-16th of an inch. In order to allow of a greater number of tubes with the same diameter of boiler, its steam-room is lessened, and a tubular steam chamber is placed on the top, surrounded completely by the heated gases from the main boiler. The engine is thus supplied with a second steam-chamber, or drying apparatus, the object of which is to dry the steam, and thus to obviate the priming to which the main boiler would be otherwise subject from its small steam-room. The heating surface of this drying apparatus varies in the different engines from 139 to 150 square feet. In the passenger engine, with four cylinders and two driving axles, the diameter of the barrel of the boiler is 4 ft. 2 15-16 in., the heating surface of the fire-box 109 square feet, of the tubes 1,558 square feet, of the drying apparatus for the steam 129 square feet; total, equal to 1,796 square feet of heating surface. The heavy gradient goods engine, four coupled axles, exhibited, has a boiler 4 ft. 2¼ in. diameter of the barrel, with 109 square feet of fire-box, 1,558 of tube surface, 129 of drying apparatus; total, equal to 1,796 square feet of heating surface. The engines with four cylinders have a 4 ft. 9 in. diameter boiler barrel, 108 square feet of fire-box, 2,034 tube surface, 154 drying apparatus; total, equal to 2,296 square feet of heating surface.

The elevation of the grate of these engines above the hind wheel, and the position of the steam-chamber and smoke-box above the boiler, do not permit of a vertical chimney of sufficient length. It has therefore been placed horizontally. The total weight of this kind of engine, in proportion to steam-producing power of the heating surface, is about 53 lbs. per square foot of heating surface.

In this pamphlet it is stated that railway companies have for some time been obliged, from occasionally working heavily laden trains on heavy gradients, to have powerful passenger engines constructed, and to adopt almost always the coupling by means of rods of two of the axles. But this coupling becomes inconvenient for express trains, having to go at a speed of more than 38 miles per hour, as the diameters of the four wheels do not always remain the same. After some time, one pair of the wheels having had more wear than the others, their diameters become smaller, which produces extra friction, and has the effect of straining the coupling rods. Besides which, these rods being of considerable weight, are subject to break when the train is running at a high speed. It is not, therefore, without some misgiving that locomotives with coupled wheels are made use of for high speeds; locomotives with independent wheels being preferred, and a heavier load being then put on the driving axle. But this case, putting aside the damage undergone by the rails, the tyres of the wheels wear out rapidly, and when atmospheric influences are not favourable, the adhesion to the rails is not sufficient, and the wheels slip.

They state that these reasons have led them to order the four-cylinder locomotives, the drawings of which they sent to the Exhibtion. The boiler of these engines is in every way similar to that of the heavy gradient locomotive. It can, therefore, truly be placed on a low framing, and above the bearing wheels, measuring 3ft. 6 in. in diameter. The extreme axles are at a distance of 16 ft. 11 9-16th in. from each other.

The small diameter wheels weigh little, and consequently require but a short and light framing. The power being divided between four cylinders, the pistons, as well as the connecting rods, and the whole mechanism, are smaller and of less weight. The four-cylinder passenger engine, with 7 tons weight of water, 2 of fuel, and a heating surface of 1,796 square feet, weighs 48 tons.

There is a separate steam regulator for each pair of engines. The pressure of the steam in the boiler is 118 lb. The diameters of the cylinders are 14 3-16th in. The stroke of piston is 13 7-16th in.

As we stated before, the engine actually exhibited is a goods tank engine, 8-wheeled, coupled, and burning coal. The other goods engine, with 4 cylinders, 12-wheeled coupled, is shown in a drawing.

The following table gives a comparison of the principal dimensions of these two goods engines:—

	Heavy gradients. Four axles coupled.	Four cylinders. Six axles coupled.
Area of grate	28·2 sq. ft...	36 sq. ft.
Total heating surface ...	1,796 sq. ft...	2,296 sq. ft.
Pressure of steam	118 lbs.	118 lbs.
Diameter of cylinders...	1ft. 6 7-8in...	1·4 ft. 9-16 in.
Stroke.......................	1ft. 6 7-8in...	1·5 ft. 5-16 in.
Diameter of wheels	3·6 ft.	3·6 ft.
Weight on driving wheels, engine full	42·3-4 tons...	56 3-4 tons.
Weight of engine full ...	42 3-4 tons...	56 3-4 tons.
Weight of engine, &c., per square foot of heating surface	53 lbs...........	55 lbs.

The steam drying apparatus of all these three kinds of engines is made of iron tubes, 3⅛ in. outside diameter, and ⅛ in. thick. The tubes are fastened without ferules. The heated gases pass round the chamber and through the tubes. The foot-plate is 5 ft. long for the heavy gradient engine exhibited, and 5 ft. 7in. for the two four-cylinder engines. The ash-pan is in three parts. The centre part has the shape of a double-inclined plane, to catch the air in both directions of running, and to drive it towards the grate. There are two Giffard's injectors on the boiler. The boiler is fixed to the framing at the two ends only. The wheels are of wrought iron, and have balance weights forged on them. The reversing gear is double, and is worked by a rod on each side of the engine.

II

(To be continued in our next.)

LIVES OF THE ENGINEERS.*

(SECOND NOTICE).

On Stephenson's return from Scotland, he found that his father had met with a serious accident, and which had been the means of reducing him to a state of extreme poverty. "While engaged in the inside of an engine, "making some repairs, a fellow workman "accidentally let in the steam upon him. "The blast struck him full in the face; he was "terribly scalded, and his eyesight was irre- "trieveably lost." George's return was therefore opportune, for none of the family save himself were in a position to assist their parent in his hour of direst need. To pay off the debts which the old man had contracted, and which amounted to £15, was the first act of the dutiful son, and the next was to remove his parents to a comfortable cottage near the West Moor, at Killingworth. In this cottage they lived for many years afterwards, George being their sole supporter. For himself he obtained employment once more in his position as brakesman, at the West Moor Pit. His hopes at this period were not of the brightest hue. Indeed, it is notorious, that in 1807-8 the condition of the working classes in England—thanks to the war which then raged—was bad in the extreme. George Stephenson, with many of his co-workers, was drawn for the militia. All the money he had saved, and six pounds which he borrowed, were devoted to the payment of a substitute, and thus he was reduced to severe straits. It was at this juncture that he contemplated emigrating to the United States. Fortunately for his native land, he could not raise sufficient money for the realisation of this project. The intensity of his feelings, however, may be imagined from a remark which he subsequently made to a friend on the subject. "You "know," he said, "the road from my house "at the West Moor, to Killingworth. I re-

* This will be described in our next number.

* Lives of the Engineers, with an account of their Principal Works; comprising also a History of Inland Communication in Britain. By Samuel Smiles. With numerous Portraits and Illustrations. Vol III.; George and Robert Stephenson. London: John Murray, Albemarle-street, 1862.

member once when I went along that road I wept bitterly, for I knew not where my lot in life would be cast."

It has been said, and the truth of the saying has often been experienced, that "the darkest "hour is that before the dawn," and it was essentially so in the case of George Stephenson. He was not the man to yield to despair, and in conjunction with two other brakesmen, "he took a small contract under the colliery lessees for breaking the engines at the West Moor Pit." Many improvements were made by the trio in the mechanical and other arrangements connected with the works, and they resulted in saving to the owners of the pit, and profit to themselves. The experience thus gained fitted Stephenson for other and more important undertakings. In 1810 a pit was sunk by the "grand allies" (the lessees of the mines) at Killingworth. An atmospheric or Newcomen engine, originally made by Smeaton, was fixed there for pumping water from the shaft. From some defect or other in its construction, it failed to do its work efficiently. Naturally this engine attracted the attention of the workmen generally of the district, and of Stephenson among the rest. He had, indeed, watched its erection and foretold its weakness. Further inspection followed, and having expressed an opinion that he "could alter her, and make her draw," Mr. Dodd's, the head viewer of the mines, determined to allow him to try his hand at the task. "The engineers hereabouts," said Mr. Dodds, "are all beat, and if you can succeed in accomplishing what they cannot do, you may depend upon it I'll make you a man for life." Stephenson first stipulated for the removal *pro tem.* of the old hands, who were jealous of his interference, and then set himself, with a party of men he had selected, in earnest to the work. "The engine was taken entirely to pieces. The cistern containing the injection water was raised ten feet; the injection cock was enlarged to nearly double its former size, and it was so arranged that it should be shut off quickly at the beginning of the stroke." It was found also that the boiler would bear a greater pressure than five pounds, and, contrary to the instructions of both Newcomen and Smeaton, Stephenson determined to load it up to a pressure of ten pounds. In three days the alterations were completed, and when the engine was again started, it performed all that was required. The pit was drained, and the workmen were "sent to the bottom."

For this work Stephenson received "the biggest sum of money he had ever before earned in one lump." In addition to this Mr. Dodds appointed him engineer at the High Pits, and his reputation as an engine-doctor spread far and wide. Other achievements followed this success, and in 1812 Stephenson was appointed engine-wright at Killingworth High Pit, at the salary of £100 per annum, under the "grand allies," a company, it may be well here to state, consisting of Sir Thomas Liddell (afterwards Lord Ravensworth), the Earl of Strathmore, and Mr. Stuart Wortley (afterwards Lord Wharncliffe). Thus, then, by dint of perseverance, observation, and industry, had George Stephenson advanced to a position of comparative honour and responsibility, and it is impossible not to draw from his career, lessons of encouragement and hope. With the same certainty that a man who puts alternately one foot upon the step above that upon which the other rests, will ascend a ladder, had Stephenson advanced from the cowherd to the engine-wright. He had learnt and practised the poet's injunction—

"Honour and fame from no condition rise;
Act well your part, there all the honour lies."

At Killingworth Stephenson devoted some attention to that *ignis fatuus* which has misled in times past so many clever men, and which yet has here and there a follower—perpetual motion. His efforts were, of course, futile, but the mechanical practice which he gained from the prosecution of abortive schemes was not without its value. He put himself, too, under the tuition of John Wigham, a man of "letters" and of "figures," and thus added to the scanty knowledge he had gained under Robin Cowens and Andrew Robertson. Another consideration now weighed with him, and this was the education of his son. It may suit the purpose of the *Athenæum*, sometimes unjust, and frequently ungenerous, to attempt, as it has done in its last issue, to rob the father in this case of the merit of attending to his son's education, but there is abundance of evidence, we believe, to sustain Mr. Smiles's statements. Robert Stephenson was sent, in the first instance, to the roadside school at Long Benton, kept by Rutter, the parish clerk, and there gained such rudimentary instruction as that functionary was only able to give him. In 1815 he was sent to Mr. Bruce's school, in Newcastle, being then twelve years of age. "His father bought for him a donkey, on which he rode into Newcastle and back daily; and there are many still living who remember the little boy dressed in his suit of homely grey stuff, cut out by his father, cantering along to school on his 'cuddy,' with his wallet of provisions and his bag of books slung over his shoulder." His progress at Bruce's academy is said to have been "satisfactory though not extraordinary," and, so far as he could, the elder Stephenson supplemented the information the boy obtained at school by practical lessons at home. Mr. Smiles describes pleasantly a visit which, in company of Mr. Robert Stephenson, he paid in 1854 to the neighbourhood in which the boyish days of the latter were spent, and gives the substance of their conversation. This, though exceedingly interesting, cannot be transcribed here. We all know what early recollections are, and how deeply the incidents and accidents of school days remain imprinted on the mind. In Robert Stephenson's case this was remarkably so, but we must leave the proof of it to be discovered in the chronicles of the "Lives of the Engineers."

Whilst the elder Stephenson was at the High Pit, he devoted such leisure time as he had to the repairing of clocks, and thus added somewhat to his income. It was at the same time that he constructed a sun-dial, which still exists and testifies to his ingenuity, while it tells of the flight of the hours. The temptation to linger over the early reminisences of the two great men, whose characters are depicted so well by the author of the work under notice, is great, but space warns us not to do so.

In Chapter six, we find an excellent sketch of the history of the locomotive engine, and this almost deserves quotation in its entirety.

The first locomotive made by George Stephenson was tried upon the Killingworth Railway, "on the 25th July, 1814." On an ascending gradient of 1 in 450, the engine succeeded in drawing after it eight loaded carriages, of thirty tons' weight in all, at about four miles an hour. This was, of course, a rough specimen. The parts were huddled together, and its jolting motion soon disarranged everything. It was, indeed, considered to be next to a failure, and had not Stephenson applied to "Blutcher"—for such was the popular name given to the engine—the steam-blast, it probably would have been a complete failure. The application of the steam-blast proved to be the salvation of the scheme; and so confident was Stephenson now of future success, that he took out a patent dated 28th February, 1815, for a locomotive engine, which combined many excellent points. An engine was constructed on this principle before the close of the year, and it may fairly be regarded as the type of the locomotive of the present time. The story of the invention of the "Geordy," or safety lamp, is already well known, but ampler particulars in reference to its origin are furnished by Mr. Smiles. The risks which the inventor ran in testing it practically are also made apparent in the "Lives," and they go to prove the courage and determination of the man. Into the rival claims of Sir Humphrey Davy and George Stephenson for priority in the construction of a safety lamp, we cannot go. It is likely that the inventions were parallel and independent. Both inventors, therefore, are entitled to equal honour. To this day the "Geordy" lamp is used in the Killingworth Collieries, while elsewhere the "Davy" flourishes.

Many alterations in the internal economy of the mines with which Stephenson was connected owed their origin to his fertile mind and inventive skill, and most of these were attended by practical benefit. He however, began next to pay attention to the construction of the railways in connection with the mines. "All railways were at that time laid in a careless and loose manner, and great inequalities of level were allowed to occur without much attention being paid to repairs." These evils Stephenson sought to remedy, and his efforts were successful to a considerable extent. One great improvement made was in altering the system of jointing the rails; he substituted a *half-lap* for the *butt-joint* previously in use, and contrived for it a new kind of chair for supporting the rails. These changes were embodied in a patent, which, in conjunction with Mr. Losh, an iron-founder of Newcastle, Stephenson took out in September, 1816. In the same patent some modifications of the locomotive were also embraced, and it is a fact that some of the engines made by Stephenson in the year just named are still in use at the Killingworth Collieries. The application of steam to travelling on common roads obtained, at the instance of friends, a share of our engineer's notice about the year 1818, and in conjunction with Mr. Nicholas Wood he conducted some experiments to this end. Stephenson soon became disenchanted of the notion, and advised others to relinquish the attempt. His judgment, as we now know, was sound, and although Traction engines of admirable construction and great power are at present successfully employed, it is not likely that the locomotive will ever be made to serve in the place of horses on common roads.

The opening of the Hetton Railway, in 1822, was a great triumph for George Stephenson. He had remodelled the line on his own plans, and five of his locomotives were on the 22nd of November in that year set to work upon it.

Meantime, Robert, who was now serving in the capacity of viewers' apprentice, at Killingworth, assisted his father, so far as possible, in the realisation of his schemes, "the two working together as friends and co-labourers," and their evenings were spent in profitable study. In the year 1820 it was determined that Robert should go for a time to the Edinburgh University, and as is well known, this wise resolution tended immensely to the well-being of the student. While at Edinburgh, his conduct was marked by strict application, and

the sure result followed; his mind was prepared for the conception of designs for the great works he was afterwards destined to achieve. At the University he obtained the prize for mathematics, and after six months' sojourn there he returned to Killingworth, and re-entered upon the active business of life. Of the elder Stephenson's association with Mr. Edward Pease, the projector of the Stockton and Darlington Railway, most persons are aware, but Mr. Smiles, by aid of that persevering spirit of inquiry which distinguishes him, has been enabled to furnish many new facts in relation to it. Of Stephenson's survey of the line, of his appointment as engineer to the Company, and the opening of the railway on the 27th of September, 1825, we are told; but for these doings, and other interesting particulars in reference to them, we can but suggest that the reader should refer to the pages of the "Lives of the Engineers." So far as the carriage of coals upon the line was concerned, it was a great success, and now came another epoch of improvement. It was suggested that passenger traffic should be commenced, and to this object Stephenson turned his attention. A coach, or rather a caravan, was built under his direction at Newcastle, and this was christened by its parent "The Experiment." "A row of seats ran along each side of the interior, and a long deal table was fixed in its centre. The company's arms were afterwards painted on its side, with the motto, 'Periculum privatum utilitas publica.' Such was the sole passenger-carrying stock of the Stockton and Darlington Railway in 1825. . . . . The 'Experiment' was fairly started as a passenger coach on the 10th of October of the year in question." It was drawn along the rails by one horse, and "did" the distance of twelve miles in two hours. The fare charged was 1s., without distinction of class. Such was the beginning of that mighty traffic which is now carried on through the jungles of India and the bush of Australia, and which will in time extend itself to every part of the globe where the adventurous foot of man is likely to be planted.

It is necessary to pass on now to the period of the projection of the Liverpool and Manchester Railway. In the work before us, a *resumé* is given of the means by which, in the teeth of great opposition, Stephenson pursued the object which, in his mind, he had determined should be attained. To Thomas Gray and to William James their fair share of credit is given in relation to the matter. The Parliamentary battles which had to be fought and won are all detailed with adequate minuteness. The Bill was defeated in the first instance, much to poor Stephenson's dismay; but, as has been shown before, he was not the man to be beaten, either by men or circumstances, and he patiently bided his time. Meanwhile, a new survey was made of the proposed line, and this was conducted by Messrs. George and John Rennie, whose names thus became imperishably and honourably associated with the Liverpool and Manchester Railway. Mr. Charles Vignolles was appointed to prepare the plans, under the direction of the Messrs. Rennie.

All being prepared, another Parliamentary campaign was commenced, and this time the victory was to the engineers. In the course of the final discussion some extraordinary speeches were made in both houses against the project, and Sir Isaac Coffin delivered himself of certain prophetic warnings which, could he have peeped only a few years into the future, would assuredly have remained coffined in his own breast. "What was to become," he asked, "of coach-makers and harness-makers, of coach-masters and coachmen, of innkeepers, horse-breeders, and horse-dealers? Was the house aware of the smoke and the noise, the hiss and the whirl, which locomotive engines passing at the rate of ten or twelve miles an hour would occasion? Neither the cattle ploughing in the fields, or grazing in the meadow, would behold them without dismay. Iron would be raised 100 per cent. in price, or more probably exhausted altogether! It would be the greatest nuisance, the most complete disturbance of quiet and comfort in all parts of the kingdom, that the ingenuity of man could invent!" These eloquent remarks, as we know, failed completely in covincing the "House," and this consummation was due largely to the influence of the gifted but unfortunate Mr. Huskisson. The cost of obtaining the act, nevertheless, was £27,000.

George Stephenson was presently appointed engineer to the company at a salary of £1,000 per annum, and he straightway removed to Liverpool. The story of the difficulties overcome at Chat Moss and other places, is a thrice told tale, but Mr. Smiles invests it with new interest. Let us, however, for the present leave the sturdy engineer to his gigantic labours, and return to his son. Robert had assisted his father in superintending the works of the Hetton, and the Stockton and Darlington Railways. In 1824, he accepted an engagement under the Colombian Mining Association, and proceeded to South America to assist in the working of the gold and silver mines in New Granada, or Colombia. Three years at this place sufficed for him, and disease drove him home in 1827. He next assisted his father with counsel and advice in regard to the work upon which he was engaged. Of the details of the trials of the "Rocket," and other locomotives, all mechanical men are aware as they are of those of the opening of the Liverpool and Manchester Railway, on the 15th of September, 1830. These are amplified upon in the book under notice, and may be read again with fresh interest by many, coming as they do from the graceful pen of its accomplished author.

The next great step in railway works was the construction of the London and Birmingham line, and here the talent of Robert Stephenson found "ample room and verge "enough" for its development. Chapters 15 and 16 are devoted mainly to the history of the formation of this then stupendous undertaking, and an account of its opening in 1838. Most of the great engineering works of Robert are eloquently and elaborately discoursed upon by Mr. Smiles in the concluding part of the volume. The period of the railway mania, the rise and fall of King Hudson, and all the concomitant circumstances in connection with that period, are dealt with. The opinions of George Stephenson on many interesting questions of a mechanical nature are also recorded, and at last we reach the fatal hour when his indomitable spirit succumbed to the King of Terrors. At the age of sixty-seven, and on the 12th of August, 1848, George Stephenson died. Of the services which he rendered, not only to "the State," but to humanity, it is not necessary further to speak. His career is one which all may study with profit, and his example should serve to arm those who are struggling against difficulties, with unquenchable energy.

The statue of the great man, recently erected in Newcastle, is in every way worthy of him, as it is an exemplar of the brilliant talent of the sculptor, John Lough. It stands in a thoroughfare frequented by working-men, and as Mr. Smiles suggests, we can imagine them looking up to his manly face there depicted, and repeating the words which Robert Nicoll addressed to Robert Burns:—

> "Before the proudest of the earth
> We stand with an uplifted brow;
> Like us thou wast a toiling man—
> And we are noble now!"

We have left ourselves but little space for noticing the last few years of Robert Stephenson's life, and the vast achievements he effected during them. So recent is his departure from among us, and so well known are most of his works, that we regret this the less.

On the 12th of October, 1859, the end came, and the grave closed over the worthy son of a worthy father. Peace be unto both!

We must not omit to state that the third volume of the "Lives of the Engineers" is admirably illustrated, as its predecessors were, and that in all other appointments it is excellent.

INTERNATIONAL EXHIBITION.

JURY REPORTS.

CLASS XXXII.—STEEL.

SECTION A.—*Steel Manufactures.*

JURY.

J. Brown, President of Section, Sheffield; Mayor of Sheffield.
Frémy, Deputy-Chairman, France; Member of the Institute; Professor at the Museum of Natural History, and at the Polytechnic.
Robert Jackson, Secretary, Sheffield; Steel Manufacturer.
Thomas Jessop, Sheffield; Steel Manufacturer.
Dr. Karmarsch, Zollverein; Director of the Royal Polytechnic school, Hanover.

The Jury of Class XXXII. have the honour briefly to report on the various articles which have been submitted to their examination, and also to offer a few observations relative to the progress and present position of some of the trades which have come more immediately under their notice.

They met for the first time on the 7th of May, and elected a deputy-chairman, two presidents of sections, and two reporters.

Having ascertained that very few of the foreign exhibits were ready for inspection, they adjourned for a week, when they again met, and commenced their examinations, which were continued till the 30th of May, and on that day their awards were finally agreed upon and duly noted by the Hon. Mr. Portman, Deputy-Commissioner of the class.

The whole number of exhibitors whose contributions came under their examination appears to have been—

From the United Kingdom..........	130
From the British Colonies............	18
From Foreign Countries..............	136

This statement, however, is not strictly in accordance with the Official Catalogue, which contains the names of several, no doubt intending exhibitors, but whose contributions never arrived; while on the other hand, the names of a few foreign exhibitors, whose productions arrived late, are omitted.

They were also called upon to examine some contributions appearing in other classes, but which evidently belonged to Class XXXII. If, therefore, the contributions of any exhibitor should have escaped observation, the Jury can only attribute this omission, either to the lateness of arrival, the delay in arrangement, or error in classification.

Steel and Steel Manufactures.

The Jury consider the most important branch of industry in this class is that described in the Jury Directory under Section A, as "Steel and Steel Manufactures."

It seems, however, somewhat strange tha light and fancy articles, such as steel pens, needles, fish-hooks, and steel toys, should have been put in this section, while the heavier steel goods such as scythes and sickles, files, and edge tools

are classed with knives, scissors, and razors in Section B.

The origin and progress of the steel trade are at the present time so well known (the subject having of late years occupied the attention of many eminent writers), that to give in this report even a brief sketch of its history would seem to be out of place; yet it appears desirable to direct attention to its development since the Exhibition in 1851.

Patents for Improvement in the Manufacture of Steel.

During the last eleven years, from May, 1851 to May 1862, no less than 177 applications for patents have been made for improvements in the manufacture of steel, and 127 of these have been actually sealed.

This statement evinces the deep interest which is felt by scientific and practical men of the present day in reference to the productfon of this, the most useful of metals, and also to the desirability of improving its quality, cheapening its price, and of being able to make it with certainty ot such a uniform character, that it may be specially suitable for the various purposes for which it is required, whether those purposes be the watch-spring, the lancet, the razor, the railway-wheel, or the heavy crank-shaft of the steam-engine.

Yet out of these 127 patents there is only one which had brought about any striking change in the mode of producing steel, or which has been attended with any real practical or commercial results—and this is the process patented by Mr. Bessemer.

Bessemer Process.

And even Mr. Bessemer does not contemplate that the metal or steel made by this process will supersede the steel made in the old-fashioned way, but rather that it will become a substitute for wrought-iron, in most cases where large masses of metal are required.

The Jury think it right to state in this report what in their judgment are the peculiar characteristics of the Bessemer metal or steel: this judgment having been formed partly from their own experience and partly from information received from Mr. Bessemer and other scientific and practical men, some of whom have both worked the process and used the metal.

When nearly decarbonised it is a soft homogeneous useful metal, suitable for cannon, ship and boiler plates, piston-rods, slide-bars, and generally for large forgings for constructive purposes; but when in this state it will not harden, and can be welded only with difficulty. It is, therefore, obvious that for all purposes where the welding property is required, or where hardness combined with toughness and elasticity are essential, or for articles capable of receiving a high polish, or sustaining a fine and keen-cutting edge, this is not the right sort of metal or steel to use.

When a larger proportion of carbon is left in the metal, it is then difficult to obtain uniformity of temper or quality, and there is no certainty even that all the ingots from the same conversion will prove workable.

Experience has also shown that the quality of the produce by this process, as by the old one, depends in a great measure on the nature or properties of the material used.

Good Bessemer metal cannot be produced from inferior or unsuitable pig iron.

A scientific and thoroughly practical man, in writing to one of the Jury, gives the following opinion of the Bessemer metal:—

"The difference between the first-class steels made in the old way from Swedish steel irons, and the metal or steel produced by the Bessemer process seems to be this: that in the former several good steely qualities are combined, constituting their excellence; while in the latter it is difficult, at present, to obtain in one piece more than one of these qualities; for instance, if left hard it is not tough, and if left soft and tough, it will not harden.

"Time, aided by skill and experience, will, no doubt, cure or remove some of these faults or deficiencies, while others, perhaps, will remain as being peculiar to, or inseparable from, the process. As fast as these imperfections are removed so will the range of its usefulness extend; but it will have to find and make a field for itself."

The Jury have no data upon which to form an opinion as to the quantity of Bessemer metal at present produced, except so far as regards Sheffield, in which town about seventy tons are made weekly.

Mr. Bessemer (United Kingdom—6427) exhibits specimens of cannon, rollers, rails, tyres for railway wheels, and a variety of large castings and forgings made from Bessemer metal; also a collection of saws, files, edge tools, and cutlery manufactured by various firms, from steel supplied by him, but melted in crucibles, in the ordinary way, and not from ingots produced direct from pig iron by his process.

Puddled Steel.

The consumption of puddled steel in the United Kingdom, for manufacturing purposes, is very limited, the prevailing opinion being that greater regularity of temper can be obtained by carbonising the bar, either in the converting furnace or in the crucible, than can possibly be secured in the puddling furnace.

This kind of steel is, however, extensively produced on the Continent; and several specimens of it are exhibited in the Austrian, the Zollverein, and the Swedish departments, but they are not of such a character as to require any special notice here.

English Steel-Iron.

Great improvement has been made in the manufacture of English steel-irons, by mixing foreign with English pig.

These irons are now generally used for purposes, for which fifteen years ago nothing but common Swedish brands would have been deemed suitable.

The production of this kind of iron has greatly increased, not only in various parts of the United Kingdom, but also in foreign countries; and in Sheffield, where its manufacture was introduced only a few days ago, it has now become an important branch of trade.

Old Method of Making Cast Steel.

The old method of making cast steel, first introduced by the late Mr. Huntsman, continues steadily to progress.

By this process cast steel is produced, combining in the highest degree hardness with toughness and elasticity, capable of being welded, of receiving a brilliant polish, and of sustaining the finest cutting edge. It is therefore specially suited for the manufacture of good tools, whether they be the chipping chisel, the turning and planing tool, the file, or the taps and dies required in the machine shop, the saw and axe of the backwoodsman, the various implements of the agriculturist, the blade of the razor or lancet, the delicate spring of the watch, or the useful pen and needle; in a word, the use of this metal is now so general that there is scarcely any branch of industry that can entirely dispense with it.

The number of converting furnaces at present erected in Sheffield and its immediate neighbourhood is 205, being an increase of 60 since 1851. These new furnaces are, however, larger by at least twenty-five per cent. than the old ones, which would make the increase equal to seventy-five of the old size, or about fifty-two and a-half per cent.

If worked regularly, making due allowances for repairs and other unavoidable hindrances, these 205 furnaces would produce annually 78,720 tons of blistered steel.

The present number of melting furnaces, or holes, as they are usually termed in this town and neighbourhood, is 2,437, being an increase since 1851 of 1,104, or about eighty-two and a half per cent.

These furnaces, if worked regularly, making due allowances for repairs and holidays, would produce 60,772 tons of cast steel in the ingot; and if from this quantity be deducted fifteen per cent. for waste, ends, and parings, caused in the processes of forging, tilting, rolling, and paring, there would remain 51,656 tons of saleable cast steel as the annual produce.

The recent application of this metal to crinoline has, no doubt, given a great impetus to the trade. It is computed that there are at the present time from 130 to 150 tons consumed weekly in the manufacture of this still favourite and fashionable part of female attire.

The quantity used in the manufacture of that useful and now necessary article, the steel pen, is estimated at about sixteen tons a week, being an increase since 1851 of about forty per cent.

It is worthy of remark that in this trade there have been no unions, known as "trade-unions," and yet the workmen have been well paid for their labour, and disputes between them and their employers very few. The trade is principally recruited with workmen from the agricultural districts, who usually commence with 18s. a week wages, and many are advanced, after a few years' service, to from 24s. to 36s. a week according to their aptitude and ability.

The above-mentioned rates of wages apply to workmen employed in the converting and melting furnaces; those engaged in the tilts, forges, and rolling mills will earn from 24s. to 66s. a week.

Next to the steel trade the greatest progress and improvement appear to have been made in those branches of manufacture which have, as it were, been created and are still supported by the wants of the vast railway and steam navigation systems, viz., the manufacture of railway springs, buffers, steel rails, wheels, tires, and a variety of other large steel forgings and castings required for constructive purposes.

Sheffield has now become the principal seat in the United Kingdom for the manufacture of these articles.

Messrs. Thomas Turton and Sons (6,467), Charles Cammell and Co. (6,432), and John Brown and Co. (6,430), exhibit large and varied assortments of them, which for excellence of quality and workmanship cannot be too highly commended.

They are also made extensively in France, the Zollverein, and other foreign countries.

The Jury have pleasure in referring to the large, excellent, and useful contributions of Messrs. Naylor, Vickers, and Co., Don Works Sheffield (6,448), consisting of cast-steel bells, cast-steel railway whels and tires, crossings, and large cast-steel forgings.

The manufacture of bells, tires, wheels, and crossings from cast steel, is a recent application of this metal, and great credit is due to the proprietors of the Don Works for introducing so important a branch of trade into this country.

The Jury are informed that the processes adopted at the Don Works are the same as those carried on by M. Krupp at Essen, and the Bochum Mining and Cast Steel Manufacturing Company at Arnburg.

Although the contributions of M. F. Krupp, of Essen (Prussia—1,308), are not in Class XXXII., but in Class VIII., the Jury consider them of so important a character as to deserve special notice at their hands. The remarkable features of this collection are the enormous size of the castings and forgings, and their perfect soundness and uniformity of temper as shown by the fractures. In this respect M. Krupp is at present far in advance of other manufacturers—one block of steel in this collection is of the extraordinary weight of 40,000 lbs. M. Krupp exhibits specimens of cannon, and rollers beautifully finished, also cast-steel railway wheels, tires, and a variety of other large steel forgings.

The jury refer also with pleasure to the productions of the Bochum Mining and Cast Steel Manufacturing Company of Arnburg (Prussia, 1,253), although appearing in Class V. This company exhibits a large cast-steel bell weighing 22,300 lbs.; cast-steel wheels and tires.

The processes of manufacture at Arnburg are the same as those at Essen.

Pen, Needle, and Fish-hook Trades.

The progress in the metallic pen, the needle,

and fish-hook trades since 1851 has been considerable, not only as regards the quantity produced, but also in the style, finish, and quality of the articles.

The Jury have not been able to ascertain accurately the percentage of increase of production; but from information received from persons competent to give a correct opinion on the subject, infer that it has been at least from 30 to 40 per cent. These trades still suffer greatly from the dishonest practice of foreign manufacturers, especially Prussians, impressing the marks and labels of the best English makers on their cheap and inferior articles. The Jury noticed that nearly all the descriptive labels on the packages of needles exhibited by Prussian manufacturers were in English.

The contributions from these trades number, viz.:—

	Pens.	Needles and Fish-hooks.
United Kingdom	10	16
France	4	—
Zollverein	—	6

Considerable taste has been shown by the exhibitors in the arrangement of the cases, so as to display in an advantageous manner the great variety of shapes and style of finish of the numerous articles within them.

ON THE WEAR AND TEAR OF AGRICULTURAL STEAM-ENGINES AND THRESHING MACHINES, WHETHER FIXED OR PORTABLE.*

(Concluded from page 290.)

BY HENRY EVERSHED.

DEPRECIATION OF THRESHING-MACHINES.

WE have seen the *portable single-blast machines* working well at eight or ten years old: to be sure some of them had been nearly re-constructed and paid for twice over in adopting the various improvements introduced since they were first built in the early days of portable thresing-machines. Considering that all these improvements have brought them much nearer perfection, we may safely allot to the single-blast machines a duration of ten years, and to the double-blast that of eight years. We shall suppose them to be worth £10 to £20, according to size and first cost, at the end of the time. We refer to such machines as are used two days a week, and at the same time well managed. With less work they would of course last longer. It would be a very large farm to find work for a machine even once a week; but in common practice, when not fully employed at home, they are sent out to earn some part of the purchase money; and this is obviously good policy in the case of a machine liable to be superseded before it is worn out.

Fixed barn-works are used far less often, since it is likely that not more than 2,000 quarters of corn will be brought to the same spot in one year, and generally much less; yet even this quantity would only employ the machine once a week: the *repairs* will therefore be far less considerable. The wear and tear of a machine firmly fixed and quite level are comparatively small; since it is always in the dry, the charge for the waterproof cloth may be omitted, and that for the driving-strap reduced to 15s. Any heavy expense in repairs or renewal of the parts, such as the drum or concave, ought not to occur for many years after erection; and the usual wearing of brasses, and straps, and other small items of expense, ought not to exceed £3 a year for a term of 14 years.

We make the following extract from a letter of Mr. John Sowerby, jun., of Beelsbey, who has two barn-works—erected in January, 1856, and November, 1857—which thresh the growth of 400 acres of corn a-year:—"The barn-works have cost for repairs, about £3 9s. 6d. for one of them until July, 1857, and for both barn-works, from that time until December 31, 1861, about £9 6s. 5d., besides 14s. 6d. for a set of knives for the barley-awner. They were not looked over last summer, but are in good working order." This is only £1 3s. 9d. per annum for *each*, for four years.

There is, however, a liability in this, as in the portable machine, to outlay in introducing modern improvements into the working parts; with this in view the machine should be made as simple as possible, and the dressing apparatus should be separate

As a basis for calculations in our attempt to estimate the exact amount of depreciation, we will suppose the fixed machine to be worth £10 to £30 at fourteen years old; it will probably be worth more, but the valuation ought, on principle, to be low, for it will be remembered that our charge of £3 a year for repairs has not provided for effecting any heavy item of renewal or improvement.

Table showing Amount of Repairs and Depreciation for Portable Threshing-Machines—Single Blast.

Horse Power.	Price	Suppos'd Value in 10 Years.	Amount of Depreciation and Interest per Annum for 10 Years.	Amount of Repairs per Annum for 10 Years.
	£	£	£ s. £ s. £ s.	£ s.
4	85	10	9 14 + 0 10 = 10 4	8 0
7	100	10	11 12 + 0 10 = 12 2	9 0

Repairs, &c., for Portable Thresing-Machines—Double and Treble Blast.

5	95	10	13 0 + 0 10 = 13 10	10 0
7	110	15	14 12 + 0 15 = 15 7	12 0
8	120	20	15 4 + 1 0 = 16 4	14 0

For Fixed Threshing-Machine to finish the Grain for Market.

Horse Power.	Price.	Suppos'd Value in 14 Years.	Amount of Depreciation and Interest per Annum for 14 Years.	Amount of Repairs per Annum for 10 Years.
	£	£	£ s. £ s. £ s.	£ s.
7	120	20	10 2 + 1 0 = 11 2	3 0

Repairs, &c., of Fixed Threshing-Machine with separate Dressing Apparatus and Elevators.

8	140	30	11 2 + 1 10 = 12 12	4 0

For Fixed Threshing Machine—Single-Blast.

5	80	10	7 0 + 0 10 = 7 10	2 10

COST OF THRESHING.*

Since the cost of maintaining a seven-horse power portable engine amounts to £35 12s., and of a seven-horse power single-blast machine—including £3 a-year for driving-strap and water-proof cover—to £24 2s., the number of days each is used in a year must be ascertained, in order that the proper proportion may be charged to each day's work. Our calculations have been made on the supposition that the threshing is confined to the work of one large farm; if the engine is let out, a different estimate must be made.

The following are the average quantities of corn threshed in a day of ten hours by a seven-horse power portable engine and single-blast machine, in use three days a-week on an average, in a good district in Essex.

The owner of this machine found that an eight-horse power engine and finishing machine averaged about the same amount of work as a seven-horse power single-blast machine, for the years 1860 and 1861; the average quantity of coal, costing 18s. per ton, used for the former was 8¾ cwt., and for the latter 7½ cwt.

EXPENSE OF A DAY'S THRESHING BY SINGLE-BLAST MACHINE, ESTIMATING THE ENGINE TO BE USED ON THE FARM ONCE A-WEEK, AND THE MACHINE THIRTY DAYS A-YEAR.

Crop of 1860 (a wet harvest):—

Reaped wheat,	46	quarters, at	1s. 9d.	per quarter.
Mown ditto	38	,,	2s. 1½d.	,,
Barley	33	,,	2s. 5¼d.	,,
Oats	50	,,	1s. 7d.	,,

Crop of 1861 (a fine harvest and average crop):—

Reaped wheat,	52	quarters, at	1s. 6½d.	per quarter.
Mown ditto	46	,,	1s. 9d.	,,
Barley	40	,,	2s. 0d.	,,
Oats	55	,,	1s. 5½d.	,,

DETAILS OF COST BY SINGLE-BLAST MACHINE WHEN WORKED IN THE FIELD, AND STRAW LEFT STACKED ON THE SPOT.

	s. d.	£ s. d.
1 engineer	3 6	
1 feeder	3 6	
2 to supply, &c.	3 0	
3 on stack	6 0	
1 to shake straw	2 0	
1 to pitch ditto	2 0	
3 to stack ditto	6 0	
1 carting water and coal	1 4	
1 horse ditto	2 6	
2 men to load and carry corn	4 0	
1 to drive	0 9	
1 horse	2 6	
3 to move and carry chaff and cavings to barn	2 6	
1 horse ditto	2 6	
		2 2 1
Depreciation and repairs of engine, supposing it to be used on the farm once a week		0 14 3
Depreciation and repairs of machine, 30 days a-year—with say £3 a-year for driving-strap and water-proof covers		0 16 1
Oil and 7½ cwt. of coal		0 8 6
		£4 0 10

COST OF THRESHING WITH DOUBLE-BLAST MACHINE.

	£ s. d.
Labour as in the case of the seven-horse power single-blast machine	2 2 1
Depreciation, &c., of an eight-horse power engine	0 15 3
Depreciation of machine	1 2 1
Oil and 8¾ cwt. of coal	0 10 0
	£4 9 5

EXPENSES OF A DAY'S WORK OF A FOUR-HORSE POWER MACHINE, ESTIMATED AS BEFORE.

Crop of 1860:—

Reaped wheat,	30	quarters, at	1s. 11d.	per quarter.
Mown ditto	20	,,	2s. 10½d.	,,
Barley	23	,,	2s. 6d.	,,
Oats	30	,,	1s. 11d.	,,

Crop of 1861:—

Reaped wheat,	36	quarters,* at	1s. 7d.	per quarter.
Mown ditto	30	,,	1s. 11d.	,,
Barley	28	,,	2s. 0½d.	,,
Oats	35	,,	1s. 7½d.	,,

Coal used, 5 cwt. a-day.

DETAILS OF A FOUR-HOUSE POWER MACHINERY, AS IN THE FORMER CASE.

	s. d.	£ s. d.
1 driver	3 6	
1 feeder	3 6	
1 to supply ditto	2 0	
2 on stack	4 0	
1 on straw stack	2 0	
1 to pitch ditto	2 0	
1 to move corn and load it	2 0	
1 horse ditto	2 6	
1 to drive	0 8	
1 to rake chaff and cavings, and help load	1 0	
1 to drive ditto to barn and fetch coal and water	1 4	
1 horse for ditto	2 6	
		1 7 0
Depreciation of engine		0 11 7
,, machine		0 13 5
Oil and coal, 5 cwt.		0 5 6
		£2 17 6

To these average results it may be interesting to add the particulars of two trials, made by the writer on January 21 and 22, 1862, with a single-blast machine, made in 1854, driven by an eight-horse power engine, made in 1856, by Messrs. Clayton and Shuttlework. On the second day we threshed of mown wheat, 10 quarters; of

* From the Journal of the Royal Agricultural Society.

* It may be interesting to note the latest prices for threshing by flail, on a largo farm in Surrey:—

Prices for 1860.			Prices for 1861.		
Wheat	4 0	per quarter.		4 0	per quarter.
Barley	3 0	,,		2 9	,,
Oats	1 10	,,		1 8	,,
Peas	2 3	,,		2 3	,,

My informant states "the price for labour has risen considerably in this neighbourhood during the last few years. The price for wheat threshed would, a few years since, have been 6d. or 8d. per quarter less than in the last two years. The present labourers want to work less and to earn more than those of the last generation.

This sounds like the knell of one of the departing customs of our fathers.

* Forty-four quarters was the maximum in one day. To each of these estimates we must add 4½d. per quarter for incidental expenses, and, in the case of single-blast machines, 2½d. per quarter for dressing twice and measuring. In practice, it is usual to dress once and re-measure, even after the so-called finishing-machine, partly to get a uniform sample, and partly to improve the dressing and obtain accurate measure.

straw, 61 cwt.; of cavings, 4¾ cwt.; of chaff, 7 cwt. per hour. The crop was not heavy, only about 4 quarters per acre. This gives 24 acres threshed in ten hours, yielding 100 quarters of wheat, 30½ tons of straw, 5 tons 7 cwt. cavings and chaff. This was a larger proportion of cavings and chaff than that obtained at other trials.

The number of men and lads employed was 19; and they had a short distance to carry the straw; 12 cwt. of steam coal w e used.

On the first day we thresh d 8 quarters of barley an hour, having five m n on the stack and two on the stage to supply the feeder, and the machine could certainly have borne faster feeding if the men on the stack could have delivered the straw faster. The corn, in a day of ten hours, would have amounted to 80 quarters, the straw and cavings to 23½ tons, and the chaff to 1 ton 1 cwt. The crop was only 5 quarters per acre, and the straw long and coarse.

The number of hands employed, including two lads, was twenty-one. The costs, with these maximum results, adopting our former calculation, would be 1s. per quarter for the barley and 9¼d. per quarter for the wheat.

But we have not yet stated the whole of the expenses of threshing in the field, which include the cost of removal, of clearing up, and of thatching the stack; and for purposes of comparison with threshing by flail we ought also to bring the straw to the barn or yard. Removals may probably take five horses and one man a quarter of a day, on the average, every time the machine is used, and cost, say 3s. 4d.; clearing up, one horse and a boy, 3s. 4d.; thatching, at 6d. per square, 4s.; for 15 tons of straw, a fair day's threshing, carting home the same quantity of straw, 7s. 6d. These expenses of course vary with the site of the stack, the convenience or otherwise of storing, and the care taken of the straw, and the attention or neglect of neatness in the stack-yard; on the whole, we believe them to be no more than the average. It will be seen that they add 18s. 2d. to the expenses of a day's threshing, or 4½ per qr. at 48 qrs. per day, to the cost of separating the grain from the straw and chaff and of carrying each to the barn.

Portable straw elevators may be referred to as a means of assistance in certain cases, though their price and cost of removal precludes their being used with economy where labourers can be obtained at 2s. per day. The cost of one to deliver straight is about £50, or to deliver at any angle, about £60, varrying according to length. Their sale has been almost entirely confined to districts where labourers are scarce.

THRESHING BY FIXED MACHINE, EIGHT-HORSE POWER.

	£	s.	d.
Depreciation and repair of engine supposing it to be used once a week ...	0	7	1
Do. do. Machine 30 days a year ...	0	9	4
Oil, and 8 cwt. of coal	0	9	0
Interest on building (proportion of £9)	0	3	7
Do. on elevation and shafting, £50 ...	0	3	0
Labour (as previously detailed)	1	9	6
	£3	1	6

The last item includes eight horses to cart the crop from the stack, and eleven men and boys. The straw is carried into the straw-rick by elevators consisting of an endless web, which may be put up at the expense of from £10 to £20, according to length.

On farms where much straw is used for feeding, the expensive process of cutting it into chaff may with very great economy be carried on at the time of threshing. Ten tons of chaff may be cut in a day, and supposing from twelve to fifteen tons of straw to be threshed, the remainder is stored elsewhere. The cost of chaff-cutting by steam power has been recently estimated at 6s. per ton, which we consider a fair average price; but in this case it is cut at only the cost of the extra coal, and of the two men to "yelm" the straw and feed the machine, the straw being brought to it by the web, and the chaff either falling into the store-room or being taken there by the exhaust tube. To enable a smaller engine to do this double work the threshing-machine may be fed slower than usual with economy. It takes four or five horse-power to work the chaff-machine, but the so-called eight or ten horse-power engines give at least half as much power again as their name implies.

Mr. Jonas's practice, when both cutting chaff and threshing, is to apply the power to a strong extra shaft fitted to the front of the threshing-machine; from two pulleys affixed to this shaft both the drum and the chaff-machine are driven: in this manner no extra strain is put upon the drum-shaft. By these means the whole of the cost of stacking, and afterwards bringing the straw to the chaff-engine, is saved. It is thus cut and stored at very little more expense than the cost of a few extra cwts. of coal for the engine. The credit of these really practical and economical arrangements is due to Mr. Maynard of Whittlesford. Mr. Jonas showed us a barn in which he was in the habit of storing the produce of nearly 100 acres of straw cut into chaff, and well trodden; and since the chaff, when well salted and trodden in a dry place, heats slightly and improves with keeping, this method of storing may be recommended as a means of getting rid of the accumulation of the straw about the premises at certain seasons of the year.

It may be useful to know how much chaff, well trodden in, will go into a certain space: one of own our chaff-houses, in which we have tried the experiment, is 35 ft. long, 15½ ft.wide, and 11 ft. high. Its content is therefore 5,967 cubic feet, and it holds 19½ tons of wheat-straw chaff, = 306 cubic feet per ton. Eight acres of mown wheat-straw, of last harvest, rather a heavy crop, weighed exactly 12 tons, and occupied a space, when trussed and stored in the straw-rick, of rather more than 12,000 cubic feet. In round numbers, trussed wheat-straw occupies a space of 1,000 cubic feet per ton:—more, if stored loose and untrodden; less, if well trodden with horses: cut into short chaff and well trodden, it takes less than one-third of that space.

The combined arrangements for threshing and cutting chaff at the same time, a e becoming all the more practicable from the increased power of the engines in common use. In 1851 the average of the portable engines made by Messrs. Clayton and Shuttleworth was five-horse power, and in 1855 nearly seven-horse power. And as the question of steam-ploughing becomes more and more one of practical utility and economy, there is no doubt that the larger engines will be the most desirable upon farms.

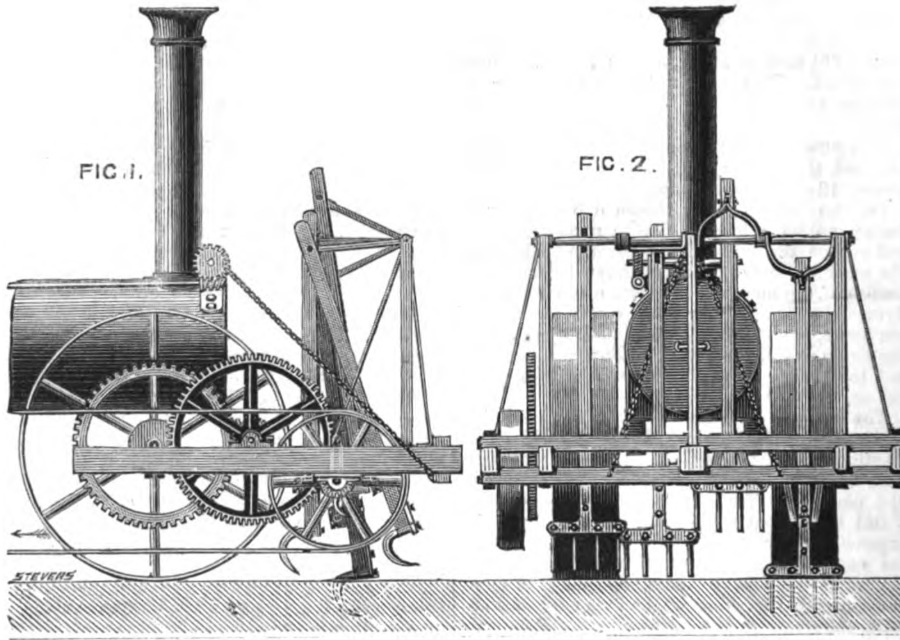
SIR DAVID BREWSTER ON THE PATENT LAWS.

LAST week Sir David Brewster delivered an introductory address at the opening of the Edinburgh University, from which we extract the following interesting passages on the above subjects:—

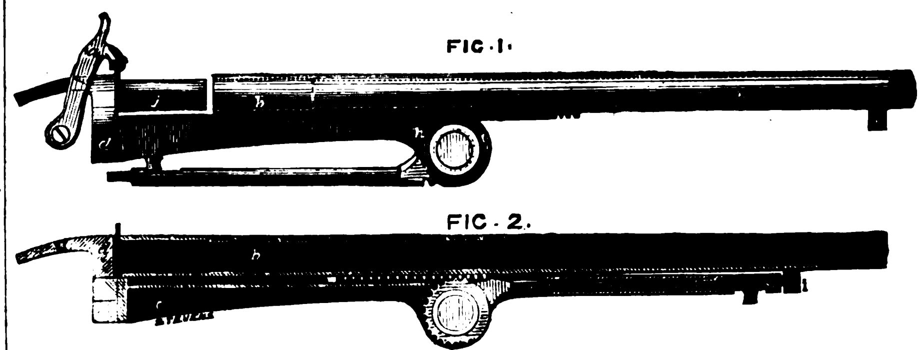
Among the subjects which occasionally arrest and agitate the public mind, there are few which immediately affect the position and interests of educated men. Such questions, however, have occurred, but they have generally been settled by the united wisdom of the Government and the Legislature, without any of those appeals to popular or party clamour under which great measures have been often abandoned or impaired. A question of this kind, however, has unexpectedly arisen respecting the amount of protection which inventors should receive from the Legislature: and there is, doubtless, no subject more important to educated men, whether their education has been completed in the school, the workshop, or the university. You are all aware that the author of any literary work, however small be its dimensions, and however frivolous its subject, enjoys, by the laws of England, the sole right of publishing it for twenty-eight years, and during the rest of his life. The only tax exacted by the law, and that only for the benefit of the public, is the presentation of five copies to the principal libraries in the kingdom. The artist, the engineer, the draftsman, the geographer, the hydrographer, and the sculptor, enjoy the same valuable right; and so complete is the protection afforded by the law that piracy is almost unknown; and works thus secured constitute a property, which can be as safely transferred as land or money in the funds. It is otherwise, however, with the inventor of new machines, new instruments, and new processes in the fine and useful arts. While the author can instantly dispose of his work, or draw the profits which it may yield, the inventor must devote himself to the developement and practical application of his invention. When his arrangements are complete, he applies for a patent, and he receives a right to use his invention for fourteen years by paying fees and expenses which, half a century ago, amounted in many cases to £400 or £500. The right thus obtained was entirely illusory. His parchment, indeed, bore the Great Seal of England, but the patent could be reused, and the price of it forfeited, either from want of complete originality in the invention, or from frivolous defects in his own description of it. In this state of the Patent Law, injurious to the interests of the public, and ruinous to inventors, our distinguished Chancellor, Lord Brougham, directed his attention to the subject, and carried two bills through Parliament which reduced the price of patents, and removed many of the more obnoxious provisions of the former law. These improvements were generally acceptable, and though inventors were still dissatisfied with the large sum of about £150 or £200 which they had to pay, and with the imperfect protection which their pat nt secured, they nevertheless submitted to the operation of the law, in the hope that future legislation might improve it. Under these circumstances, men of science, and inventors of all classes, were startled with a proposal made by a distinguished engineer, that the Patent Law should be repealed, and that there should be something like free trade in inventions. In addressing an assembly of civil engineers at Sheffield, Sir William Armstrong stated "that the dauntless spirit which, in matters of commerce, had led this country to cast off the trammels of protection, had resulted in augmented prosperity to the nation, showing the injurious tendencies of class legislation when opposed to general freedom of action;" and he expressed a hope "that the same bold and enlightened policy might be extended, in some degree at least, to matters of invention. For his own part, he was inclined to think that the prestige of successful invention would, as a rule, bring with it sufficient reward, and that protection might be entirely dispensed with." Under the free trade of the present day, thus highly and justly appreciated, we receive the corn and the wines of one country in return for the iron and the coal of another; but it exceeds our comprehension how there can be free-trade between two parties, one of which is the small class of discoverors and inventors, and the other the whole mass of society, who are not inventors at all, and who, with all the influence of numbers, wealth, and position, would instantly appropriate and turn to profit every discovery in science that had a practical bearing, and every mechanical idea that could be embodied in an instrument or a machine. Between such parties as these there can be no interchange of ideas, and no reciprocity of interests; and as there can be no dealings between them, there can be no freedom of trade in any sense analagous to that great commercial doctrine to which reference has been made. But even under the present Patent Laws, as they exist in every part of the Old and New World, there is already something approaching to freedom of trade. Every foreigner can obtain a patent in England on the same terms as an Englishman, and an Englishman enjoys a similar right in return. The producers of ideas, therefore, are in every country in the same relative position nearly as the producers of those commodities which are interchanged under free-trade—the non-producers of ideas and the non-producers of commodities deriving alalogous advantages under the law—the one from the importation of useful inventions, and the other

from the importation of the necessaries and luxuries of life. There is still, however, another variety of free-trade in inventions which, we think, is the only one that deserves the name. Were a patent right granted at the cost merely of its registration to every applicant, and continued with equal security during the same period as copyright, every new idea—every scheme of ingenuity or adventure—would be brought before the public, and elaborated for the use of man. Such a scheme may be expected in some future age, when statesmen may have learned to face problems before which they now quail, and appreciate interests to which they are now insensible. Regarding all intellectual rights as equal, and as sacred as any other species of property, it is not easy to understand why they should not be placed under the same ægis. *Esto perpetuum* is the brand which God and reason have stamped upon whatever man's genius or man's industry has created for the good of man. If the rich or the barren soil which conquest has wrested from the savage, or industry won from nature, is protected with as much care as the life of its owner, why should we not equally protect the rights achieved by genius, whether in the useful arts it creates for humanity new powers and products, or bless our species with the divine creations of poetry, or eloquence, or art? If James Watt has bequeathed to us mechanism to bring water from its earth-bosomed springs, or iron from its stony bed, or coal from its fossil grave; if Milton has sung the loss and recovery of Paradise in strains moral, religious, and sublime, why should not the philosopher and the poet enjoy the same right of property as a landlord who reclaims a moss, gives verdure to a heath, or makes the yellow grain wave over a beach of sand? I should hardly have been justified by the speech of Sir W. Armstrong in taking alarm at the revolutionary opinions which he has maintained; but it is well known that a Cabinet Minister of high influence has given utterance to the same views, and a Committee of Parliament has been appointed to report on the subject of patents in all their relations. The British Association was the first public body that took alarm at the new doctrines, and boldly denounced them; and an inventor's institute has been formed in the metropolis to resist, by every legal means, any measure of spoliation that the Government may be induced to support. I have brought this subject under your notice in the belief that every educated man has a substantial interest in obtaining a due protection to inventors, and in the hope that in your debating societies you may regard this subject as worthy of discussion.

MORRIS'S MACHINE FOR CULTIVATING LAND.



PARFREY'S BREECH-LOADING FIREARMS.



MORRIS'S MACHINE FOR CULTIVATING LAND.

The above engravings represent a machine for breaking-up and cultivating land, which has been recently patented by Mr. J. Morris, of Essington, Stafford. The machine is fitted with a series of forks or prongs, having an advancing horizontal motion, which are made to enter the land to the depth of several inches, and afterwards rise therefrom, ths said forks or prongs performing a nearly circular motion in a vertical plane. The machine is constructed in the following manner:—At the back of a steam locomotive engine a horizontal shaft is supported, to which a rapid rotary motion is given by the motion of the engine of the locomotive. The shaft is at right angles to the path of the engine. A series of excentrics are fixed on the shaft, and to the under side of clips encircling the eccentrics the forks or series of prongs are fixed. A vertical rod is fixed to the top of each of the clips of the eccentrics, and each of the rods is jointed to a horizontal guide rod turning upon a joint at the back of the engine. By the rotation of the shaft carrying the eccentrics the forks or prongs are made to perform a nearly circular motion in a vertical plane. This motion, combined with the advancing motion of the locomotive, causes the forks or prongs to enter the land, performing a nearly semi-circular motion therein, and rising therefrom to re-enter it a short distance in advance of the point at which they last entered it. The eccentrics are so arranged on the shaft as to make the forks or prongs enter the ground in succession, and thereby to equalise the resistance. The prongs are of a curved figure.

PARFREY'S BREECH-LOADING FIRE-ARMS.

Mr. J. Parfrey, of Upper Belgrave-place, Pimlico, has patented an improved breech-loading firearm, which consists in applying to the ordinary false breech of a gun a strong und light sliding bar, on which the barrels are arranged to slide longitudinally forwards sufficiently to admit of the introduction of cartridges at the breech ends of the barrels, which are, by a forward sliding action, presented open, and which, when loaded, are slid back into close contact with the false breech, a small groove or notch being left in each barrel, in order to admit the projection of the detonating pin of the cartridge. In order to slide the barrels forward and backward with facility, and obtain power enough to make a close joint at the breech, a small lever or handle is employed, with a sector or pinion and a rack, the one attached to the barrels, the other to the sliding bar; when the barrels slide home, this lever is brought up under the barrels, and secured by a catch pin. These improvements are applicable to firearms having one or more barrels, which may be joined together and actuated by one handle.

Fig. 1 is an outside edge view of part of a double-barrelled gun with the stock removed, shewing the breech-piece and slide, the handle and sector for actuating the barrels, and the barrels which, having been discharged and slid forwards, a cartridge is shewn extracted ready to be released by the lifting of the hammer. Fig. 2 is a section through the centre of the breech-piece, slide, and one barrel, shewing the barrels brought home to the breech by the reversal of the handle below, which is secured by the spring pin at the end locking into the staple under the barrels. *a* is the hammer; *b*, *b*, the barrels chambered out so at to receive the cartridges, and having grooves to admit the detonating pins; *c*, a slide with V-shaped edges, strengthened by webs underneath, to which the barrels are fitted; this slide may be formed in one piece with, or be securely screwed, as shewn, or otherwise attached to the breech-piece *d*, and to the stock by screws, *s*; *e* is a lever or handle, the boss at the end of which is cut, as a sector, into teeth on its outer edge, so as to work into the teeth *f* attached to the under side of the barrels; the groove in the slide admits of the passage of these teeth; the handle *e* moves on the hollow pin or thimble *g* fitted to the cheeks, *h*, of the slide, and secured by a nut, so as to give facility for removal when it is desired to separate the barrels from the stock; by lifting the hammer *a* the spent cartridge *j* falls aside, then fresh cartridges being inserted into the open ends of the barrels,* the handle *e* is brought down from the position shewn at Fig. 1, and up again, as at Fig. 2.

M. Mathieu (de la Drôme) has addressed a letter to the Paris journals, in which, after alluding to the means now acted on in England for prognosticating storms some hours, and even a day beforehand, he declares that he will, whenever it may be wished, furnish to France and to all the countries of Europe, the means of foreseeing all atmospheric phenomena, not one day, but 50 years in advance.

H. SMITH'S FOUNDRY LADLE APPARATUS.

FIG. 1.

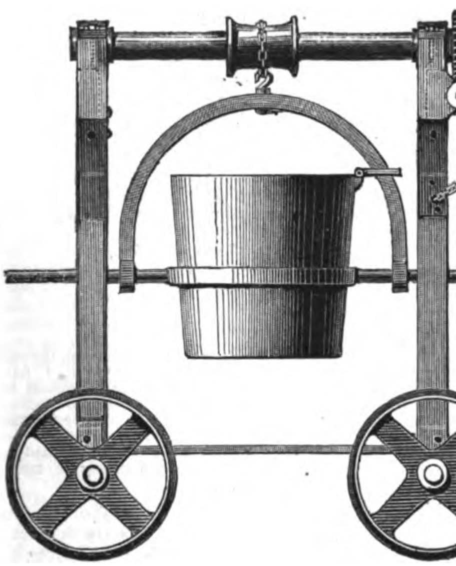
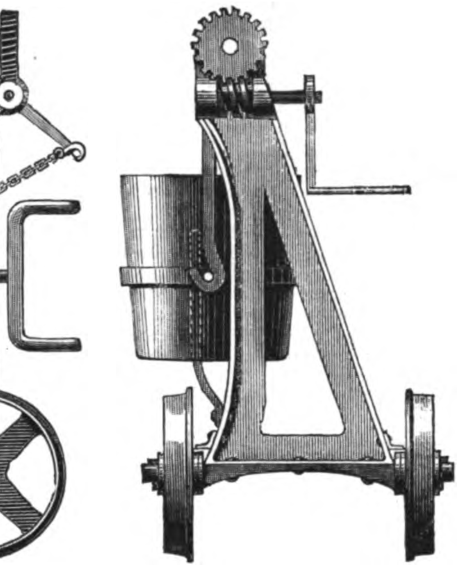


FIG. 2.



SMITH'S FOUNDRY LADLE APPARATUS.

THIS invention, patented by Mr. H. Smith, of the Teesdale Iron Works, Stockton-on-Tees, has for its object improvements in apparatus used when casting iron or other metal. For this purpose a carriage or truck is used with upright end frames suitable for receiving a ladle between them. At the upper part of these end frames there are bearings for an axis, on which axis there is fixed a barrel, on which is wound a chain to which the ladle is suspended, as illustrated in the above engravings. The axis is arranged nearer to one side of the carriage than the other by preference, but it can be placed in the centre if required, and the end framings are strongly braced or connected together. On the axis is fixed a screw or worm wheel, which receives motion from a screw or worm on a suitable axis, on which is fixed a handle or hand wheel, by which motion is given to the axis of the screw or worm, and consequently to the barrel, in order to raise or lower the ladle, or it may be raised or lowered by gearing or rachet wheel and lever. To facilitate the tilting of the ladle, the tilting bar is received into hooks or bearings at the two ends of the arched frame or bar which is suspended by the chain on the barrel. The four wheels of the truck, or carriage, are suitable for running on a rail or tramway laid down between the cupola or other melting furnace and the place where the moulds are situated.

THE DOUBLE SCREW PROPELLER— THE FLORA.

ON Friday last the "Flora," with her double screw propeller, enjoyed her trial trip on the river between Tilbury and Mouse Light.

The application of double screws under the quarters of a vessel is neither new in theory nor in practice. Some years since Captain Carpenter applied them, under the sanction of the then Lords of the Admiralty, to a pinnace under his command. The Americans have for years past used double screws in some of their large river steamers, and some of their iron ships recently built are also fitted with them. Commander Symmonds, R.N., in an able paper read by him at a meeting of the United Service Institution, and since published, satisfactorily pointed out the many advantages to be derived by this application of the screw, and laid before the meeting draughts and models of non-fouling screws, worked by separate engines, invented by himself and Mr. Roberts.

Mr. Dudgeon, however, has been the first to give us a practical illustration of the immense advantages possessed by two screw propellers over a single one. The "Flora," of 400 tons, double screw propeller, was built at Blackwall from designs by that gentleman. At the trial on Friday last the "Flora" left Tilbury-wharf, having on board Mr. Dinen, R.N., Admiralty Inspector of Steam Machinery; Commander Symmonds, R.N.; Captain Selwyn, Captain Crookshank, Mr. Dudgeon, Mr. W. Dudgeon, and a select party of officers in the naval service and mercantile marine, and many well-known yachtsmen; also, several gentlemen connected with Her Majesty's dockyards, amongst whom were some connected with the Swedish and Russian marine.

The dimensions of the "Flora" are as follow:—Length in load line, 150 ft.; beam, 22 ft. 6 in.; depth in hold, 13 ft. 6 in.; nominal horse-power, 120; indicated horse-power, 400; two screws of three blades each, 7 ft. in diameter, and having a pitch of 14 ft. 6 in. On the day of trial she drew 7 ft. water aft and 5 ft. 5 in. forward. Her displacement was 350 tons, and the area of immersed midships section 130 square feet. She is rigged as a fore and aft polacca-masted schooner; her masts fitted with joints near the deck, so that they can be lowered down should occasion require it; she is also fitted with a telescope funnel. Immediately after leaving Tilbury-wharf, her commander put her obedience to the helm to a severe test by steering a course in the form of the letter S through a fleet of shipping that lay at anchor off Gravesend: and the manner in which she steered completely set at rest any doubts that might have existed under this head. She then proceeded at moderate speed to the Nore Light, working at 15 lb. pressure, at a speed to the vessel of 10·6 knots, of the screw 14·5, with two knots of flood tide against her, and an estimated slip of two knots—making an average of 12 knots an hour. She was abreast of the Nore at 1h. 55m. 25s., just at high water, and then proceeded on her trial to the Mouse Light-vessel, 7½ nautical miles' distant. In the middle of the trial she was working at 18 lb. pressure, and the screws making 106 revolutions per minute; her engines, also made by Mr. Dudgeon, worked well. The Mouse Light was reached at 2h. 27m. 6s., exactly in 31 minutes 43 seconds. She left the Mouse Light for the Nore at 2h. 29m. 28s., and reached the latter at 3h. 18m. 40s.; she was 15 minutes detained on this passage by the port engine bearing getting heated, which would leave her passage up, against the first of ebb, at 34 minutes. After this successful trial trip we may soon expect to hear more of double screw steamers worked by double engines.

It has been sometimes observed that coke has ignited spontaneously after being, seemingly, completely extinguished by water. This phenomenon has been explained on the supposition that the coke had been originally charged with sulphate of iron, and being imperfectly extinguished, had been heaped up in places where the air was stagnant. Chemical combinations of sulphur and iron have a strong affinity for oxygen in such a case, and give out sufficient heat to bring on ignition throughout the whole mass. The lignites of Germany, which often contain iron pyrites, are also subject to this occurrence, particularly when the slack coal is carelessly left in the workings of the mine. It may be prevented by careful ventilation.

HUNTER'S IMPROVEMENTS IN ANCHORS.

THE accompanying engravings represent an improved anchor recently patented by Mr. S. Hunter, of Grey-street, Newcastle-upon-Tyne. In this improved anchor the shank or stem is made with an oblong opening near the crown end, that end of the shank or stem being spread out in a suitable manner for having such opening formed therein. The arms of the palms are of a bent or curved form, and their ends, where they pass through the crown, are scarfed together. The outer surfaces of the ends of the arms, where they turn in the crown, are cylindrical, so as to turn freely in the opening formed in the crown. These ends of the arms are securely keyed together, and there are washers or

FIG. 2.

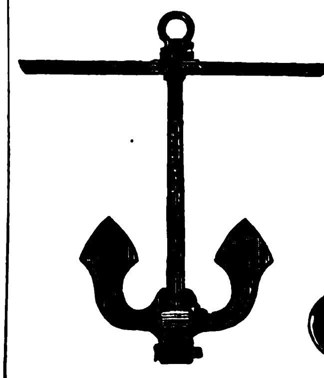
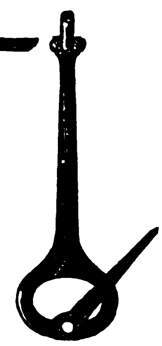


FIG. 1.



free collars between the keys and the crown of the anchor. The two arms are connected together by a bar between the palms and the ends of the arms which turn in the crown. The ends of this bar pass through the arms, and are keyed. The middle of the connecting bar is notched out in such manner as to fit the interior edge of the opening formed through the spread-out end of the stem or shank; this edge, on which the bar moves, is struck from the centre of the opening in which the arms turn in the crown of the anchor, so that when the strain comes on the palms, such strain is received by the connecting bar, which is supported by stops formed on either side of the extremities of the spread-out portion of the stem or shank. The two palms take the ground, and hold at the same time.

THE BENDING OF WOOD.*

THE applicability of bent wood for an increasing variety of purposes is both surprising and instructive. Here in this great lumber country, and in many others, it is used in all departments of business and pursuits of life wherever man and his products are known. It is as ancient as history, and is found among the artifices employed in the rudest state of barbarism. Little is known of the most ancient devices for bending wood, but the oldest patented in England has now been practiced for nearly a century, and is yet used there for some purposes. In 1813, at Woolwich Navy Yard, England, floor timbers, 16 inches square, for a man-of-war, were bent over an arc of a circle with a radius of four feet. All these devices, as well as almost all others subsequently used, restrained, in some degree, that tendency found in wood to elongate its outer curve when under the operation of bending, the same as is now claimed to be done in apparatus brought as near the state of perfection as the nature of wood and the change of position the particles undergo will admit. The organic structure of all woods of the endogenous or internal growths, and the exogenous or external growths, are similar, and possess the qualities of cohesiveness and compressibility, more or less, differing most in the degree or quantity of these two qualities, which make and determine the amount or degree of flexibility or elasticity in any wood. These qualities, with a structure that will admit any fluid

* From the "Journal of the Board of Arts and Manufactures for Upper Canada."

agency to thoroughly penetrate and soften its tissue, indicate a wood that may be made to assume any curvilinear shape required for practical use. Then only ordinary skill and judgment would be required to operate on good wood—bending successfully, without any loss occurring from breakage of the wood under the operation of bending, but where the wood has not been seasoned, or partially seasoned, a trifling loss will occur from breakage caused by the shrinkage that all woods are subject to in the process of seasoning. And in the case of unseasoned bent wood, this shrinkage acts upon the fibre of the outer curve, which is always at the point of tension, if not in an actual state of severe tension, for the reason that in deflecting any substance, but particulary wood, either with or without partial restraint, to oppose tension, the wood is acted upon by two forces, the one a crushing force that foreshortens and contracts the lesser or inner curve, with a tendency to rupture it laterally, the other a tensile force that stretches and elongates the greater or outer curve, with a tendency to fracture it transversely and lift the fibre, which is the most hurtful, and of the more frequent occurrence. These two forces are divided by a neutral line, more or less moved from either curve. When nearest the inner curve the best result is obtained, because all tension, however little, is injurious to the structure of the wood, arising from separating and drawing out the fibre, which can never be made to unite again, as in ductile and malleable substances, and because the crushing or compressing force improves the wood by forcing the fibre into the interstices or cells, and by interlacing and interlocking the fibre, the product is obtained nearly resembling the knot or knurl, which is difficult to split or cut, even when rupture is indicated.

In order to get the best result from bent wood, it is recommended that the crushing force alone be used. And this can be, if the fibre of the wood be left free to move into a new position in more than one direction from the point of bending, by beginning the curve in the middle of it when the wood is made to assume a long curve first, before taking the shorter curve of the mould, which long curvature starts the fibres throughout, and makes more, if not every particle of the wood, accessible to the influence of the softening agent already in it, and consequently more yielding to the action of the crushing force. This force should be produced and governed by fixed and immoveable restraint that should not compress the wood while in its straight form. It should also prevent end expansion, and preserve the exact length on the outer curve. This would give a product uniform in density and rigidity throughout its whole length, with the fibre undisturbed on the outer curve, to resist any tendency to change the shape produced.•The long curve gradually adapting itself to the curve of the mould, would amount to double on successive manipulation, if unrestrained; wood has been compressed into one-third of its primary bulk, with every quality improved to resist decay and wear in use. Nothing can be reasonably urged in support of the popular belief of the necessity to produce or permit tension and elongation in successful wood bending. Tension and elongation are required or permitted only in consequence of the uses of imperfect apparatus—elongation is positively indispensable in machines that bend from one end, or in one direction from the point of bending, and that press the wood against the mould with such power as to prevent all movements of the fibre, producing in advance of the point of bending a wave-like movement among the fibres of the wood, held rigidly confined and straight, until suddenly made to take the curve of the mould. The movement in advance of the bending gradually accumulates a power that resists compression thus attempted, and before the completion of the process, and in order to save the machine or the process, relaxation of restraint is required, and is followed by elongation of the wood, however small it may be. Tension acts upon the fibre, giving a product uneven throughout its whole length, and more liable to change the artificial shape. It is obvious that any augmentation of restraint during the process must give such results, and that the machinery in use for the bending of wood is far from having reached perfection. There can and will be machinery constructed to bend large timbers for marine and other structures, over any arc or curve that will not require a reduction of its bulk, by the compression of the inner curve, to less than one-half its lateral size. Past experience has shown that wood-bending machinery is most profitably employed in the production of smaller articles, for which there is an unlimited demand that will continue, because of the suitableness and superiority of bent wood for these purposes.

Iron or jointed structures are generally used on a large scale; but there can be no doubt that timber of the most imposing dimensions can be bent into many convenient forms, with considerable increase to its strength, and the appearance of the structure in which it is employed. The subject is well worthy of the attention of inventive mechanics. Steaming wood, previously to submitting it to a bending force, is now employed.

TO CORRESPONDENTS.

RECEIVED.—A. R., R. P. E., E. E., T. H. E., W. A., J. B., J. H., W. W., F. A. P., J. N., P. D., W. H. T., W. R., F. M. K.

Correspondence.

[*We do not hold ourselves responsible for the opinions of our Correspondents.*]

IRON WALLS AND NAVAL GUNS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—Another assailant of my opinion enters the field in the last MECHANICS' MAGAZINE. Mr. Cheverton, as a man of science, a logician, and a practised writer on mechanical questions, is an adversary not to be despised. I have not time this week to indite my usual letter, although there is a great deal about "Iron Walls" which I want the public to know something of. I cannot, however, by silence, leave Mr. Cheverton to suppose that, however cunning at fence he may be, he has inflicted on me any serious wounds, or even made a palpable hit.

The argument with reference to my "wood backing" *crochet*, which runs through Mr. Cheverton's letter, places me in the predicament of a physician who, having by a careful diagnosis thrown some light on the disease his patient is labouring under, is dogmatically treated as a *Charlatan*, because he is not prepared at once to apply a remedy. No account is taken of the difficulties he has to overcome in treating a difficult case, and when, like a wise man, he calls a consultation of M.D.'s, reputed more skilful than himself, one of the most eminent of the number turns round upon the earnest and anxious doctor, and twits him with uttering *truisms* in designating the complaint.

I thank my accuser for that turn, and I congratulate myself on the success of the free expression of my opinions in having drawn so able a writer into the controversy, which he will find worthy of the attention, I am glad to see, he has paid to the subject. But I wish, instead of an elaborate investigation into the precise nature of the disease, the existence and character of which he admits, he would give his aid at the consultation, to which he is called, to discover the treatment which will effect a cure. In my reply next week, I will point out some of the symptoms of the inefficiency of wood backing, and show its damaging effect on the constitution of iron plates, such as will, I hope, satisfy Mr. Cheverton that my *truisms* are *truths* which cannot be too often reiterated until England possesses "iron walls," so constructed as to be reliable national defences.

Mr. Day's communication will be noticed in my next letter. CIVILIAN.

REVOLVING BOILERS.

SIR,—In your journal of Oct. 31, I notice the description of a new marine boiler, of which it is said that its novelty "is that of making the boiler continually rotate on its axis over the furnace while at work." If your readers will refer to Galloway Hebert on the steam engine, page 376 ed. 1836, it will be seen that a boiler kept in a state of revolution over a fire was patented in 1825 by Messrs. Thompson and Barr, of Halesowen, Staffordshire. Mr. W. H. James, of London, in the year 1823, patented a revolving boiler, in which the furnace was placed inside; this may be found at page 391 of the same work. CHRONOLOGY.

JURY REPORTS.

SIR,—With reference to part of your remarks in the MECHANICS' MAGAZINE of the 7th instant, on the Report of the Jury, Class VIII., I have to state that the error of ascribing Sir William Armstrong's well-known water-pressure engines (British Catalogue, 1,785), to Messrs. Smith, Beacock, and Tannett, did not exist in that report, as it left my hands in July last.

I am, Sir, &c.,
W. J. MACQUORN RANKINE.

Glasgow, 10th November, 1862.

WORN-OUT PACKING.

SIR,—Could you or any of your readers inform me, through the medium of your valuable magazine (of which I have been a reader for many years), whether an apparatus for withdrawing the old worn-out packing from the stuffing-boxes of steam-engines, pumps, &c., is in use, or whether you think such a contrivance would be advantageous over the old system? Having invented a simple method for effecting the above purpose, I take the liberty of asking your opinion on the subject.

Apologising for thus troubling you,
I remain, &c.,
EDWIN E. HILL.

Rose-cottage, Vassall-road, Brixton, S.
Nov. 4th, 1862.

THE MERSEY BREECH LOADER.

SIR,—Not because this cannon can be fired 19 times in a minute do I specially advocate it, for other breech loaders could be fired very rapidly under special circumstances, though not so rapidly perhaps as this. But the beauty of the Mersey gun consists in what may be expressed in two words, viz. :—

1. Strength.
2. Simplicity.

Has it some latent weak point? I await an answer from Mr. Clay or the Liverpool Volunteers.

W. RIDDLE.

10th Nov.

PROPULSION OF VESSELS.

SIR,—Mr. Parker would be a most unnatural parent if he was not proud of his bantling, but he must let us know a few of his child's good qualities if he would have others think as well of it as he does.

I repeat that the small models cannot give us a good idea of the merits of his plan. Has it been tried on a large scale? I fear not (at all events with success), or we should have heard of it. Mr. Parker does not answer my question about relative speed with same fuel. As to the plan being "commercially useful," I meant to refer to *passenger* steamers, when speed is everything.

Again, too, Mr. Parker seems to consider a very peculiar stern with two guide pieces necessary. These could not be applied to a boat already built.

X. Y. Z.

November 11th, 1862.

Meetings for the Week.

TUESDAY.—INSTITUTION CIVIL ENGINEERS.—Discussion upon Mr. Crawford's paper on the Railway System of Germany, at 8 p.m.

WEDNESDAY.—GEOLOGICAL SOCIETY.—On the Cambrian and Huronian Formations, with some remarks on the Laurentian, by J. J. Bigsby, M.D. —On some Enaliosaurian Vertebræ from the Coal-measures of Nova Scotia, by O. C. Marsh, Esq., communicated by Sir C. Lyell, V.P.G.S., at 8 p.m. SOCIETY OF ARTS.—Opening Address by the Chairman, at 8 p.m.

Gossip.

The most awfully explosive shells it is possible to produce, being separate shells containing nitrogen and chlorine, enclosed in an outer shell, are now under the consideration of the War Office.

According to the *Moniteur des Inventions et Decouvertes*, Mr. A. Wattemare, Paris, informs the Societé d'Encouragement de l'Industrie Nationale that the manufacturers of the Northern States have been lately directing their attention to a new product they call "fibrelia," as a substitute for cotton. This term of "fibrelia" is a generic name applied to fibres extracted from several kinds of American plants, obtainable in Massachusetts and other parts of the world under the same latitude.

Mr. Donald M'Kay, the American ship-builder, in an account of the iron-clad ships of France, England, and the United States, says:—Of all the iron-cased ships that we (the United States) have,

the only one that might successfully cope with the large English frigates is the "Ironsides," built in Philadelphia. She is well planned, and her practical construction very well executed, but her speed is too slow to use the good points of the vessel to advantage, and the way of fastening her plates will not stand the test of a heavy cannonade; for in the experiments made in England with armour plates, similarly fastened by screw bolts screwed in from the inside, the bolts broke off short on the inside of the plate whenever a heavy shot struck the plate near such bolts.

As a remedy for the yellow fever, so fatal to engineers and mechanics, and others, in South America and the West Indies, Mr. James Bruce advises the following measures:—1. Dissolve one ounce of gum in half a pint of milk, and add the same quantity of lime water. To be divided into four doses in the twenty-four hours. 2. Or, twenty grains of chalk with ten grains of grated nutmeg, in a wine-glassful of milk or solution of gum. As a tonic in convalescence equal parts of port wine and gruel. The best disinfectant for sprinkling rooms and cabins (being nascent oxygen) is to dissolve any quantity of nitre in vinegar. The action of vinegar on nitre (as we learn from Scripture) is like music to the heart that is sad!

On the Magenta Boulevard, Paris, there is just now exhibiting an instrument, which is really a curiosity. It imitates the sound of the human voice—particularly the higher notes—almost to perfection. It was invented by Herr Faber, formerly a German professor of mathematics. The instrument has the external appearance of a woman seated; it is constructed according to the physiological principle of the larynx, which is represented by an india-rubber tube; the voice has a range of two octaves, and sings any given tune, with the tone, and force of a female voice; the form of the figure is rather defective, from the poverty of the inventor.

A letter from Turin says:—"A Venetian, named Giacomo Balbi, has published, both in France and England, a brief description of moveable forts invented by him, and capable of being used both on land and at sea. There is reason to believe that they furnished a hint for the construction of the Monitor, which caused so much excitement a few months ago. He has come to Turin, and has had long conferences with the Minister at War and the Minister of Marine, with the Ordnance Department, and the Admiralty at Genoa: and it seems that something, of which the details are not yet known, is to be constructed under his direction."

The Committee of the Mersey Docks and Harbour Board recommend the board to apply to Parliament in the next session for powers to borrow a sum of £450,000, to be applied in the construction of the new works in progress and contemplated by the board on the Liverpool side of the river, including the purchase from the Earl of Derby of the foreshore north of the dock estate, and the reclamation thereof by a sea wall.

A letter has been addressed to the Earl of Derby, the chairman of the Queen's committee, by four of the principal architects engaged in preparing designs for a national memorial of the late Prince Consort, urging an extension of the time allowed for that purpose, on the ground that the inroads on their time, arising from their ordinary professional work, render it extremely difficult, within the time previously named, to give to the designs that mature consideration which their importance demands; they therefore solicit that the time may be extended from the 1st December to the 1st January. The committee have acceded to their request, but with an intimation that no further extension of time can be allowed beyond the 1st of January.

Professor Ansted, the mineralogist, reports the discovery at St. Cuthbert's, in the Mendip Hills, about three miles from Wells, in Somersetshire, of a deposit of lead-producing *debris* of old mines and lead-washings of ancient miners, filling up the bed of a stream that flowed in former ages. This metallic slime, of exceeding richness, amounts, he says, to 600,000 tons, extends over twenty-five acres to the depth of thirty feet, and is computed to be worth half a million of money for the lead which it contains.

The efforts which have for a long time past been made to provide an electric telegraph for the fire brigade stations in the metropolis have resulted in an arrangement with the telegraph companies.

Complaints have been continually made of the inadequacy of telegraphic communication in France, while there was not a hamlet in the mountains of Switzerland which was not supplied with a telegraphic wire. The Minister of the Interior has consequently decided on establishing electric telegraphic offices in the principal town of each commune throughout the French empire.

Steel Shot.—The Select Committee of Ordnance, as well as the Iron Plate Committee, have now under consideration, the advisability of adopting "steel shot alloyed with silver" (the one 300th part). This alloy produces the very hardest description of steel, which, it is said, will penetrate any amount of iron or backing a ship can be made to carry with *vire viva*. The inventor states that steel shot, alloyed with this portion of silver, will not be more expense, as a much lighter shot will be used.

The Poonah.—On Saturday last the new screw ship intended for the service of the Peninsular and Oriental Company, was launched at the Thames Shipbuilding Works, Blackwall. The launch, which was witnessed by a large company, was most satisfactory. The "Poonah" is a splendid ship, of 2,597 tons burthen. Her length between perpendiculars is 315 ft.; length of keel for tonnage, 290 ft. 5 in.; breadth for tonnage, 41 ft.; depth of hold, 30 ft. No pains have been spared in her construction. She is alike beautiful in model and great in strength. As soon as she had brought up in the river, amid the cheers of thousands who studied the wharfs and banks, she was taken in tow and proceeded to Deptford to receive her engines, which have been constructed by Messrs Humphreys and Tennant. They contain every modern improvement for super-heating steam, surface-condensing, &c., with a view to the saving of fuel, and are of 500 horse-power.

Portable Ships' Engine Pumps.—Last week some trials and experiments took place in Woolwich Dockyard, by order of the Board of Admiralty, to test the relative merits of three rival portable ships' engine-pumps. The Commodore Superintendent, Sir F. Nicolson, Mr. Turner, and Mr. Thornton, and others were in attendance. The first engine tried was that of Mr. Roberts, of Millwall, and manufactured by Messrs. Brown, Lennox, and Co. This was a double-action pillar-pump, and was worked by four men, and afterwards by double that number, casting various jets of water by a change of hose-pipes, directed horizontally and vertically. It filled a tank containing 108 gallons of water in 2 minutes and 31 seconds, from one of the fitting basins adjoining the place of trial. The result was very satisfactory. The next trial was with Mr. Stone's, of Deptford, also a portable engine of similar dimensions, but pronounced superior in power and capacity in each of thg tests, as to distance, height, and the time consumed in filling the tank. The third engine was that of Mr. Gossage, of the Admiralty, and manufactured by Mr. Stone, which underwent the same series of trials as the two named above, and with a slight advantage over that of Mr. Roberts. At the termination of the trials an opinion was pronounced by the inspecting officers in favour of the engine supplied by Mr. Stone.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

The Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the Proprietors of this Magazine. Other Papers are hereby warned not to produce them without an acknowledgement:—

Steam Engines, &c., 1091, 1123, 1130.
Boilers and Furnaces, 1154.
Roads and Vehicles, including railway plant and carriages, saddlery and harness, &c., 1083, 1111, 1112, 1129, 1132, 1133.
Ships and Boats, including their fittings, 1088, 1116, 1119, 1138, 1150, 1156.
Cultivation of the Soil, including agricultural implements and machines, 1136.
Food and Beverages, including apparatus for preparing food for men and animals—*none*.
Fibrous Fabrics, including machinery for treating fibres, pulp, paper, &c., 1079, 1086, 1087, 1089, 1099, 1104, 1120, 1122, 1126, 1134, 1142, 1152.
Buildings and Building Materials, 1121, 1151.
Lighting, Heating, and Ventilating, 1021, 1139.
Furniture and Apparel, including household utensils, time-keepers, jewellery, musical instruments, &c., 1080, 1092, 1096, 1106, 1117, 1131, 1140, 1145, 1148.
Metals, including apparatus for their manufacture, 1085, 1102.
Chemistry and Photography, 1090, 1115, 1118, 1127.
Electrical Apparatus, 1095.
Warfare, 1081, 1082, 1084, 1094, 1098, 1101, 1108, 1144, 1146, 1153,
Letter-Press Printing—*none*.
Miscellaneous, 1093, 1097, 1100, 1105, 1107, 1109, 1110, 1113, 1114, 1124, 1125, 1128, 1135, 1137, 1141, 1143, 1147, 1149, 1155.

1065. F. Tolhausen. *A telegraphic dial printing apparatus.* (A communication.) Dated April 14, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1066. J. Beard. *An improvement or improvements in sofa bed or sofa bedsteads.* Dated April 14, 1862.

This consists in making that part of a sofa bed or sofa bedstead called the seat or bed reversible, that is, so as to present either of its surfaces uppermost at will, one side being a sofa seat and the other a bed. *Patent abandoned.*

1067. J. M. French. *Improvements in upright pianofortes.* Dated April 14, 1862.

This consists, first, in making the bracings of upright pianofortes of tubes of wood. The bracings are situated between the wrist plank and the bent side and bottom, and have to support the pressure which the tension of the wires exert upon the said wrist plank and bent side and bottom; second, in making the sounding boards to such pianos of Swiss pine, or other wood, joined by vertical junctions, the said junctions being covered by the belly bars of the sounding boards. *Patent abandoned.*

1068. J. Darlington. *Improvements in the arrangement of marine telegraph wires and cables.* Dated April 14, 1862.

Instead of laying telegraphic wires or cables so as to rest on the bed of the sea, the inventor proposes to arrange these in such a manner as to lie only a portion of their length on the bottom, and in deep water to suspend them by means of floating or partially submerged buoys, set at such distances as may be found necessary; also at certain distances to stay or anchor such wires or cables by means of suitable appliances. He further proposes to connect with such wires or cables, wherever it may be found desirable, floating telegraphic stations for the receipt and transmission of messages. *Patent abandoned.*

1069. J. K. Hampshire. *A safety cage, with disconnecting catch, to prevent accidents in the working of coal or other mines arising from the over-winding or breaking of the ropes or other parts used for hoisting purposes.* Dated April 14, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1070. J. Dargue. *Improvements in machinery for preparing and combing wool and other fibrous materials.* Dated April 14, 1862.

This relates, first, to the collars of the screws, which force the heckles through the fibrous material, and consists in making the parts of the screw which revolve in the bearings conical, the bearings being suitably formed to receive such conical parts of the screws. The invention consists, second, in a method of raising and lowering the fallers or heckles in what are known as screw gills. The invention consists, third, in a peculiar method of grooving the bearings and necks of machinery used for preparing, combing, and drawing fibrous material, so that the oil may be equally distributed over such surfaces. This is accomplished by cutting right and left-handed spiral grooves in the revolving shaft or journal, such spiral grooves being so arranged as to cross each other. *Patent completed.*

1071. C. Harratt. *Improvements in the manufacture of masts, yards, and booms.* Dated April 14, 1862.

Here is a mast constructed of a series of concentric tubes of sheet metal, the interstices between them being filled up with melted or dissolved india-rubber; or it may be pitch, or other matters which can be made fluid, and will afterwards set solid and yet remain flexible. *Patent abandoned.*

1072. J. Childs. *Improvements in the manufacture of wax matches.* Dated April 14, 1862.

This consists in the use of carnauba wax (a vegetable resin) in the manufacture of wax matches. *Patent abandoned.*

1073. R. A. Brooman. *Improvements in reaping and mowing machines.* (A communication.) Dated April 14, 1862.

These improvements mainly consist in the construction and employment, in reaping and mowing machines, of an apparatus constructed as hereafter described for collecting the cut crop and delivering it in sheaves from the side of the machine. This apparatus consists of an endless chain carrying rakes, which pass above and below the platform; it is supported by a fore carriage in the form of a sledge, carrying the finger beam and knife, and jointed to a hind carriage mounted on wheels. The fore carriage is supported upon two metal bars in preference to rollers, which have been found to enter the soil, grass, or straw, with which they come in contact and become entangled or charged therewith; it is supported at the rear by a train of wheels fixed to the frame, the side bar of which has a groove formed in it, covered by plates forming sockets, and uniting the frame and one of the metal bars before mentioned, whereby the necessary joint is formed for uniting the two carriages, and the fore part and cutting apparatus are enabled to follow the undulations of the soil. The outer end of the axle, on which the train of wheels is mounted, has a series of holes in it, whereby the position of the bearing or running wheel may be altered so as to equalize the resistance offered by the crop. This arrangement is intended to remedy the inconvenience arising in ordinary reaping and mowing machines from the knife moving obliquely in proportion to the strength of the crop. A toothed wheel, with spring clutch on the wheel axle, transmits motion through wheels and jointed rods to the knife. The separator or divider is fitted with a cutting blade for cutting the grass or other herb which will not separate, and which would otherwise clog it, and which is delivered on to the platform. The reel for throwing the corn to the knife has rotary motion imparted to it through

a pulley on its own shaft, communicating by a band with another pulley on a shaft, receiving motion from a pulley on the same shaft as that communicating motion to the knife. The rake chains have motion communicated to them across and round the platform by belts and bevelled wheels driven from the main wheels of the machine. The motion communicated to the rakes causes them to deliver the cut crop in sheaves or bundles on the left side of the machine at regular intervals. The pole is supported and held by a moveable bolt to a bar rising from the fore carriage, in which several holes are pierced in order to raise or lower the point of traction according to requirement. The driver's seat is placed at the rear of the machine; the driver has the whole of the machine before him, and has the working parts wholly under his control, and can with his foot throw the knife out of gear and stop the machine when he desires. This seat is placed to the left of the machine, so that its weight and that of the driver may counterbalance that of the knife carrier. If, however, this is not sufficient, a weight may be suspended from the seat and frame, so that the driver, by moving out of his seat to the left, may raise the knife carrier. This machine is with facility moved from place to place, and can be easily altered from a reaping to a mowing machine, and *vice versa*. *Patent abandoned.*

1074. R. A. Brooman. *Improvements in carriages for transporting loads on railways, common roads, and other surfaces.* (A communication.) Dated April 14, 1862.

The object of this invention is to facilitate the transport of loads over railways, common roads, and other surfaces, and it consists, first, in the employment of an elongated hollow drum, with rounded edges, which are made to serve as rails to guide the rollers hereafter described; second, in the employment of a platform or truck for receiving the load which is fitted above or inside the hollow drum; third, in the employment of rollers arranged in pairs or separately, and held together by moveable iron or steel links, forming closed or endless chains of moveable rollers, which are free to rotate round the drum and support it and the load, all as hereafter described. The invention is not described apart from the drawings. *Patent completed.*

1075. R. A. Brooman. *Improvements in Pumps.* (A communication.) Dated April 14, 1862.

The characteristic feature of this invention of improvements in pumps is the employment of two shafts, together with inclined pump barrels and pistons, as hereafter explained. One of the shafts is inclined at any desired angle, and the two shafts are coupled together by a universal or other joint, ensuring the same speed to both, and causing them to revolve in the same direction. One of the shafts carries through a horizontal disc, or cross-bars, a pair or more of pump-barrels, set at the same angle as the inclined shaft, while the other (say the inclined shaft), has fixed in the lower part an inclined cross-head, with rods and pistons, also inclined to correspond with and work in the pump-barrels. A vessel or case, fitted with a cover, which may be removed when required, has a suction-pipe fitted at the lower, and a discharge-pipe at the upper part. Both pipes are provided with suitable valves, and in this vessel the barrels and pistons are enclosed. The pump-barrels (say four) are suspended from the under side of the horizontal disc or cross-bars in such manner as to be able to adapt themselves to the inclinations of the pistons. A ring of some strong, flexible material unites and keeps the pumps water and air-tight, so that the top of the pump-barrels is in communication with the discharge, while the bottom of the pumps is in communication with the lower part of the vessel. A diaphragm may, if desired, surround the lower part of the plate. *Patent completed.*

1076. R. A. Brooman. *An improved hobby-horse.* (A communication.) Dated April 14, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1077. C. J. Coxhead. *Improvements in pianoforte actions.* Dated April 15, 1862.

Here the flys or hoppers are attached to the hammer butts, and work in a downward or inverted form; they are met on the keys by blocks with notches and hollows in them, clothed in the usual way; the ends of the flys or hoppers work off the notches into the hollows in the act of percussion. The hammers and flys or hoppers are made to return to their places after percussion by one spring, attached to each hammer and fly (conical, spiral, or otherwise, to be used either back or front), which acts on both, one end on the hammer butt and the other end on the fly or hopper, thereby obviating the necessity of any more springs or tapes to make the hammers return after percussion. The hammers escape from the strings by arms that project from the flys or hoppers, and are regulated by escapement buttons screwing on to the arms, or on to the rail above which the arms strike against. The hammers are checked by checks fixed on the notch blocks on the keys, and pass by the escapement arms and meets the stops that project from the hammer butts, the ends of the flys or hoppers at the same time stopping in the hollows below, and are hindered from going too far back by a piece of felt or other springing substance, which is placed between the hammer-rail and flys or hoppers, thereby securing a firm check and prompt repetition. The dampers consist of wires, bent in the form of quadrants, and have the damper heads attached to one end to meet the strings; the quadrant wires then pass through a socket, and work on the front ends of the damper levers, which act on centres; straigh wires are attached to the back ends of the levers, and pass through another socket at the back of the hammer-rail, and meet the end of the keys, and are regulated by buttons screwing on to the wires or keys. Weights or springs are a tached to the wires to cause the dampers to press against the strings when the fingers are removed from the keys. *Patent abandoned.*

1078. G. Fell and W. Haynes. *Improvements in machinery or apparatus to be used in the manufacture of leather.* Dated April 15, 1862.

Here the patentees cover a roller, drum, or cylinder, with emery, sand, pummice-stone, ground glass, or other rough cutting substance, or face it with rough metal, similar to a file. The roughened roller, drum, or cylinder is placed in suitable bearings, and has a rapid revolving motion imparted to it by power. The skins or hides are placed in contact with the rough surface of the roller, drum, or cylinder during its rapid motion, by which the operations commonly called shaving, paring, whitening, grounding, buffing, and softening are performed on sheep, goat, calf, seal, deer, or other skins or hides, by the friction or grinding action of the roller, drum, or cylinder. *Patent completed.*

1079. J. Taylor. *Improvements in machinery or apparatus for preparing cotton or other fibrous materials to be spun.* Dated April 15, 1862.

This relates to improvements in the carding engine, and consists in employing a circular stripper, consisting of a roller with a number of knives or combs working in slots or grooves. The knives or combs are acted upon by eccentrics, cams, tappets, or other suitable means, with a revolving motion, so as to cause the said knives or combs to project one after the other beyond the periphery of the roller, in order to strip the doffing cylinder, and then return into their slots or grooves. *Patent abandoned.*

1080. T. H. Bennett. *Improvements in the manufacture of hats, caps, or other coverings for the head.* Dated April 15 1862.

The patentee manufactures hats, caps, or other coverings from or with a combination formed by a drummed perforated leather, and a grease-absorbing material, such as prepared cotton, flannel, felt, horse hair, sponge, or any other absorbing and retaining material that will answer the purpose. He perforates the drummed leather at that portion which presses against the forehead when the perfect hat is worn. He perforates either in a single, double, or more lines of holes. Above these perforations, and as high up the leather as he finds requisite, he places a strip of the prepared absorbing material, this material lying immediately above the holes; and between the drummed leather and the inside of the body of the hat, forms a species of air chamber, and prevents the grease from passing beyond the strip of cotton (or other material) before mentioned. *Patent completed.*

1081. F. A. Le Mat and C. F. Girard. *Improvements in the construction of revolving and repeating firearms, part of which invention is also applicable to other arms.* Dated April 15, 1862.

This invention, as far as it applies to revolving and repeating firearms, consists in an improved lock, and in an improved means of fixing and of rotating the revolving chamber, when required for the purpose of firing the charge from one of the compartments, and of locking the chamber when the arm is being carried, and of causing the chamber to rotate after the discharge of one of the compartments, to present another compartment for being discharged. The part of the invention which applies to other firearms, as well as to revolving arms, is the lock. The lock is constructed as follows:—The body of the hammer is centred upon a pin held in the stock; it has a circular aperture made at the back and just above the heel, and to this heel a link is pinned which receives the fore end of the main spring, which is a simple straight blade of steel, the rear end of which is held in a jaw, or otherwise attached to the under part and inside of the stock. The breast of the hammer is formed with two notches for the cock and half-cock; a trigger and trigger spring complete the lock for ordinary firearms. For arms with revolving breech chambers, the following parts are added:—On the near side of the body of the hammer, and at the lower part thereof, a link is screwed, this link is formed with two projecting studs, one on the rear which enters an aperture made for its reception in the body of the hammer, and the other projecting from the opposite side, and fore end enters an eye in the lower end of a paul, the upper end of which takes into the ratchet on the rear of the revolving chamber; at the proper time this rachet comes into action, and drives round the chamber. In the far side of the stock a recess is formed for the reception of a circular spring let into and received to the far side of the body of the hammer. This spring is made with a projecting lip which takes into a notch made in the barrel of a bolt, the fore end of which is thinned off, passes through the shield at the rear of the chamber, and enters one or other of a series of holes made in the rear thereof; a spiral spring is fitted in the recess in the stock and keeps the locking bolt engaged in one or other of the said holes, until forced back by the spring on the body of the hammer engaging in the notch, and when so forced back the chamber is ready for being revolved by the rachet as before described. *Patent completed.*

1082. R. Roche. *An improvement in gun-carriages.* Dated April 15, 1862.

This invention consists in fitting the gun in a block, which is of such length as to receive, not only the trunnions, but also portions of the gun, both in front and in the rear of the trunnions, and in mounting this block in a semi-circular bed on each side of the gun; the sides and bottom of the block are semi-circular, and fit into the bed in such manner, that the block may be moved by worm and worm-wheel, or other suitable mechanical contrivance, so as to elevate and depress the gun according to requirement. *Patent abandoned.*

1083. C. R. Heap. *An improved construction of railway chair.* (A communication.) Dated April 15, 1862.

This railway chair is composed of two wrought-iron plates, one over-lying the other. The under plate is made rectangular, and forms the base of the chair, and the upper plate, which is smaller, lies across it, diagonally, but so that its extremities extend to the end of the base plate. These plates are connected together by a central bolt, which forms a pivot for them to turn on. The central bolt, when the chair is to be fixed in position, passes through a central hole in the plates, and is driven into a wooden sleeper intended to support the chair. The jaws of the chair are formed by turning up portions of the sides of the two plates at right angles. By this means each plate is furnished at its opposite edges with a jaw, which jaws, with the jaws of the other plate, form pairs that are intended to embrace the rail that is to be placed in the chair. Between the jaws of the joint chair and the rail, iron clamping-pieces, rolled so as to fit the web and bottom of the rail, are placed, and the abutting ends of two rails being inserted therein, they will be retained in position. The jaws of the chair are closed upon the clamps, or upon the rail, as the case may be, by turning the upper plate upon its centre, and when brought into position, the grip of the jaw is secured by driving through holes made in the lower plate and into the wooden sleeper below pins or bolts which will bear against the diagonal sides of the upper plate, and effectually prevent that plate from turning. For further securing the rails at their abutting ends, projections are formed on the inner face of the jaws of the joint chair, which projections fit cavities cut in the sides of the foot of the rails, a portion of the clamps being cut away for this purpose. *Patent abandoned.*

1084. A. V. Newton. *Improvements in the manufacture of blasting powder.* (A communication.) Dated April 15, 1862.

The patentee claims, first, the use of nitrate of baryta, obtained in the manner described, or in any other suitable manner, as a substitute (either partial or total) of nitrate of potash in the preparation of blasting powder, in the manner and for the purpose set forth. Secondly, the use, for the manufacture of blasting powder, of the nitrates of strontian and lead as substitutes for saltpetre. *Patent completed.*

1085. G. Bedson. *Improvements in the manufacture of wire ropes, and in the preparation of wire for such manufacture.* Dated April 15, 1862.

This consists, first, in employing flat wire in the manufacture of wire ropes. In straightening wire for wire ropes, the patentee causes it, after it has been rolled, to be wound upon a drum, and between those two points which hold it he cools it, and thus causes a contraction. *Patent completed.*

1086. J. Platt and W. Cheetham. *Improvements in looms for weaving.* Dated April 15, 1862.

This refers to the picking motion of looms, and consists in the adaptation of a spring buffer, or other such elastic apparatus, against which the picking-stick bears when it recedes from the shuttle. Also the patentees apply a similar apparatus for receiving the blow of the picking-stick in its forward motion. *Patent completed.*

1087. J. Platt and W. Richardson. *Improvements in machinery or apparatus for cleaning wool and other hairs of animals from burrs and other foreign matters.* Dated April 15, 1862.

In this arrangement of apparatus the patentees employ a roller, against which is placed a fixed blade, between which and a reciprocating blade, the wool, &c., is introduced. Another feature of the invention is the adaptation of mechanism to the above machinery for opening out the material previously to its being presented to the rollers and blades. For this purpose they adapt a spiked roller or rollers working in a dish, and they employ a transferring comb in conjunction with the spiked roller or rollers and fixed spikes, which draws off the material in detached tufts, and presents it to the said roller and blades. *Patent completed.*

1088. R. A. Peacock. *Improvements in constructing and working lock-gates for docks, harbours, canals, and navigable rivers.* Dated April 15, 1862.

The patentee claims, first, constructing the framing of lock-gates in layers or thicknesses of planking disposed and arranged, as described; secondly, mounting and supporting the weight of lock-gates on pivots or bearings at top, accessible for lubrication or other purposes, as described, and, also, so sustaining the gate as to move with freedom and without any support from the bottom, as described; thirdly, forming mud recesses in the piers at the back of the gates, as and for the purposes described. *Patent completed.*

1089. W. Clark. *Improvements in ornamenting fabrics and other surfaces.* (A communication.) Dated April 15, 1862.

This relates to a method of applying gold or silver leaf, or imitations thereof, to fabrics, &c., by pressure or otherwise, whereby the inventor effects a saving of 50 per cent. in the material beyond that obtained in the ordinary processes. The improvement consists in using the same sheet of metal several times at different parts of the fabric to be ornamented. *Patent abandoned.*

1090. T. W. Gray. *Improvements in the manufacture of explosive compounds.* (A communication.) Dated April 15, 1862.

Here ordinary cotton is used, by preference, cotton being a liguin substance, a compound of carbon (C), hydrogen (H), and oxogen (O), the chemical formula of which, expressed in equivalents, is C 12, H 10, O 10. By subjecting cotton, and most of the liguin substances of the above formula to the action of nitric acid in a peculiar manner, a new element (nitrogen) enters into the composition, forming an explosive compound of the chemical formula, C 12, H 7, N 3, O 22, which may also be expressed $C\,12\left\{\frac{H\,7}{3\ N\,O\,4}\right\}O\,10$. *Patent completed.*

1091. F. C. Philippson. *Improvements in steam hammers.* (A communication.) Dated April 15, 1862,

Here the anvil is made moveable, so that it may be raised or lowered. The bottom of the framing of the machine forms the anvil head, in which are formed two vertical hydraulic cylinders, containing water or oil, and a passage is formed in the anvil head, by which the two cylinders communicate with each other, so that when the ram of one cylinder is raised, the other will be lowered, and *vice versa*. The anvil block is carried on the top of the ram of one of these cylinders. The ram of the other cylinder is of sufficient weight to counterbalance the weight of the ram of the first cylinder, and of the anvil block carried by it. There are other features included in the invention. *Patent completed.*

1092. J. Crossdale. *Certain improvements in boots and shoes, and for ventilating the same.* Dated April 15, 1862.

This refers to a former patent dated 12th April, 1859 (No. 919), and consists in carrying the elastic tubing along the entire length of the in-sole of boots and shoes, the open ends of the said tubes terminating at the heels thereof, and

between the same and the top of the counters of same, instead of carrying the open ends of the tubing up at each side of the waist of the boot or shoe, as described in the specification of the said former patent. *Patent abandoned.*

1093. R. Rains. *Improvements in apparatus for freezing, cooling, and churning.* (A communication.) Dated April 15, 1862.

Hitherto apparatus for freezing, cooling, and churning have been constructed to work horizontally; the apparatus constructed according to this invention is arranged to work vertically. *Patent abandoned.*

1094. S. Barrett. *Improvements in projectiles.* Dated April 16, 1862.

This projectile is formed of cast steel. The end is somewhat smaller than the bore of the cannon, to allow for the coating, and it decreases in size towards its rear end. A lead coating is applied to the projectile, part of which may be inflammable, so as to bring it up to the size of the bore, also, which can be so attached as to follow in its rear after it has been discharged. A series of rings or shoulders are formed in the steel to keep the lead or other material in its place when the projectile is discharged, and until it strikes the object, when a portion will be detached, leaving the inflammable portion still adhering to the projectile. The steel is hollowed from its rear end to about seven-eighths of its length, when a shoulder is formed, and then a smaller bore or hollow is carried to its extremity. In this hollow an iron plug, also with a shoulder, is placed loosely to allow for the escape of compressed air when striking, and when inserted in the hollow of the projectile; the smaller end of the plug projects from the foremost orifice. *Patent abandoned.*

1095. F. W. Gisborne. *Improvements in the construction of electric targets for rifle and gun practice.* Dated April 16, 1862.

In lieu of the chemical decomposition recorder described in the specification of a previous patent, granted to the present inventor on the 16th May, 1861 (No. 1246), he sometimes uses a series of electro-magnets for printing or puncturing the paper diagram, and in order to do so effectually he charges the style points with ink almost simultaneously, and by another arrangement he causes the paper to change its position over the said styles, and thereby record correctly several shots in the same segment. He also uses a disc attached to the target hammers or balls, which moves eccentrically when in motion, and thereby imparts a rubbing electric contact to a spring suitably placed near it. He also combines permanent and electro-magnets to arrest and release at pleasure the balls or hammers when they recoil. He also imparts motion to a slide or shutter in front of the diagram by attaching thereto an iron axis, so placed that, when pivoted eccentrically, it will fly up or back, according to the position of the said axis, to an electro magnet. He also employs the alternate action of electro-magnets, between the target and firing-stand, which in effect are almost synchronous, and in accordance with the meaning of those described of the said former patent. *Patent abandoned.*

1096. T. Edwards and J. Harrison. *Improvements in letter-receiving boxes and other like receptacles.* Dated April 16, 1862.

The patentees claim the construction and use of letter boxes, and other like receptacles, with two or more cut-off flaps or leaves, or their mechanical equivalents, in connection with, and actuated by the opening and closing of a port or cover applied to the opening by which the letters or other articles are inserted into the receptacles, whereby the lower part of the box is divided from the upper portion during the time the cover of the receiving orifice is open. *Patent completed.*

1097. J. Barbour. *Improvements applicable to upholsterers' and other hand hammers.* (A communication.) Dated April 16, 1862.

This consists in magnetising hand hammers, whereby they are rendered available for picking up tacks. *Patent completed.*

1098. W. F. Loc[illegible]. *An elongated projectile to be shot from smooth-bored ordnance, and which shall retain during its flight the longer axis in the direction of its line of flight similarly to elongated projectiles propelled from rifled ordnance.* Dated April 16, 1862.

This projectile consists of a cylinder surmounted by a cone, hemisphere, or other shaped head, forming an elongated shot, the diameter of the case or circular section of the cylindrical part thereof being equal to the calibre of the piece of smooth-bored ordnance for which it is destined with the deduction of the necessary windage; and the axis or length of the projectile will be double the calibre of the piece of ordnance from which it is shot, more or less, as convenient. The projectile retains the direction of its axis or length, after leaving the gun, by means of blades or wings inserted in longitudinal clefts or sockets formed in the cylinder at certain intervals, in greater or less number, and remaining flush with the cylindrical surface of the projectile while in the gun, but projecting from its surface towards the base of the shot after leaving by means of springs, which are relieved by the shot leaving the gun or by other mechanical means. The blades or rings work on rivets or pins towards the front of the projectile, at a greater or less distance from the front of the projectile, the blades or wings extending to the base of the projectile, or short of the base, as may be most convenient, so as by resistance in passing through the air to retain the projectile in its original direction. To prevent windage, and to save concussion, a leaden wad attached to the base of the projectile, or detached, is to be used. The leaden wad is to be placed over the powder with a concave surface towards the powder. *Patent completed.*

1099. J. W. Hadwen. *Improvements in the treatment and application of soft silk waste.* Dated April 16, 1862.

This relates to improved modes of treating the material known as soft silk waste for the purpose of equalising and cleaning the fibre more effectually than has hitherto been done, and consists, 1, In using Heilmann's or other combing machine. 2, In making from the combed silk fibre, when spun, a new fabric suitable for umbrellas and parasols. 3, In mixing the combed fibre with any desired proportion of wool or mohair, and spinning it into yarn. *Patent abandoned.*

1100. D. Stott. *Improvements in the manufacture of rings from paper, millboard, or pasteboard, applicable for steam or other pipe joints, bobbin ends, or other purposes, and in the means or apparatus employed therein, which are also applicable to the manufacture of rings from other flexible substances.* Dated April 16, 1862.

This consists in stamping or cutting out various sizes of rings from one sheet, concentrically to each other, by a series of circular or annular stamps, punches, or cutting instruments, applied or attached to any stamping, punching, or pressing machine of sufficient strength, and actuating a motive power. *Patent completed.*

1101. J. Mackay. *Certain improvements in projectiles for firearms.* Dated April 16, 1862.

This consists in making the bolt in the form of a hollow cylinder or tube, the end next the powder being closed with a plate which detaches itself upon leaving the barrel, the barrel through the bolt being then left open for the passage of the current of air, which maintains the true position of the bolt as it progresses, thus ensuring the proper part of the bolt to strike the object. This form of bolt will also penetrate iron or wood more readily than solid projectiles. *Patent completed.*

1102. J. M. Rowan. *Improvements in manufacturing articles of cast steel.* Dated April 16, 1862.

This consists in applying pressure, by hydraulic apparatus, for examples to the cast steel in the moulds when in a fluid or nearly fluid condition. *Patent abandoned.*

1103. R. Cochran, and R. Cochran, jun. *Improvements in producing ornamental fabrics.* Dated April 16, 1862.

Here the object is for the production, in a novel and economical manner, of ornamental fabrics of the many coloured harness woven kind, such as bordered shawls, long shawls, or plaids, &c. And in practising the invention after one modification, supposing the article to be produced is a shawl having a self-coloured or plain centre with a border, the inner edge of which has an ornamental outline projecting unequally into the plain centre part, such border is woven separately, and being cut along the inner unequal line, is neatly stitched upon a plain or self-coloured piece of cloth. *Patent abandoned.*

1104. F. P. Warren. *Improvements in apparatus for steering sea-going vessels.* Dated April 16, 1862.

The object here is to enable sea-going vessels to be steered with greater accuracy and facility than at present; as, also, when two rudders are used, in case of accident to the ordinary rudder, to afford a means of steering the vessel independently of it. For these purposes the patentee makes use of a metallic or other rudder, situated at the forward part of the vessel, in some cases placed in a recess or opening formed in the forward "dead wood," or equivalent metal of the vessel; in others, carried by a false stem, additional to and projecting in front of the real one, the rod pintles or other axis or axes, upon or about which the rudder turns, being in each case situated at the forward side of the rudder itself. A rudder situated and hung as described, has the advantage of meeting and being acted upon directly by the solid water opposed to the forward motion of the vessel, instead of acting only against the inferior resistance offered by the more or less broken water at or about the stern. *Patent completed.*

1105. M. Cartwright. *Improvements in the manufacture of models, and of plates or pieces for artificial teeth, and in combining or amalgamating india-rubber and gutta percha with metals for the manufacture of artificial plates or pieces, and for other purposes.* Dated April 16, 1862.

This consists in a method of making models used in preparing plates or pieces for artificial teeth of vulcanite, ebonite, or hardened rubber, alone or in combination with soft vulcanised rubber. The invention also consists in a method of combining or amalgamating india-rubber and gutta percha with metals for the manufacture of artificial plates or pieces, and for other purposes. *Patent abandoned.*

1106. W. J. Marsden. *Improvements in eye shades.* Dated April 16, 1862.

These eye-shades are formed of silk, cotton, alpaca, gossamer, muslin, linen, or other light material sewn or fastened to a wire framework, consisting of two, three, or more curvulinear wires, the smallest of which adjusts itself to the forehead, and the others projecting so as to form a protecting shade set at the desired angle to the rays of light. The extremities of these curvulinear wires are jointed by vertical hinges to the ear pieces, which are similar to those of spectacles, by the intervention of short pieces of metal jointed at their opposite ends by a horizontal hinge to the spring wires which pass over the ears. The vertical hinges allow the ear pieces to be folded over the front and upper part of the shade, and the horizontal hinges allow of the lateral adjustment of the spring wires. The curvulinear wires of the frame of the shade are easily adjusted so as to cause the shade to project horizontally, or to descend and form a peak, as may be desired. *Patent abandoned.*

1107. W. E. Newton. *An improvement in setting artificial teeth.* (A communication.) Dated April 16, 1862.

This consists in a certain mode of combining the teeth with a gold platinium, or other metallic plate, by means of india-rubber or other vulcanised gum, whereby all soldering and rivetting, by which the plate is liable to be warped, is dispensed with. The metal is also prevented from oxidying, and the gum when vulcanised is made to serve as a means of strengthening and preserving the form of the plate. *Patent completed.*

1108. W. E. Newton. *Improvements in the manufacture of cannon and other ordnance, and of solid and hollow cylinders for shafting and other purposes of wrought-iron, or steel, or both combined.* (A communication.) Dated April 16, 1862.

One of the improved modes of constructing cannon and other ordnance, and shafting or cylinder, which form the subject of the present invention, consists in rolling or winding a plate or sheet of iron, or steel, or several (if more than one is required), around a central mandril of wrought-iron, steel, or other suitable material. The whole mass is then to be heated to a welding heat, and welded together as it is rolled up. The welding operation is to be effected either by the pressure of rollers, or by the impact of a hammer or hammers, while the metal is at a welding heat. If a gun or piece of ordnance is to be produced, the mandril should be of less diameter than the desired bore of the gun or cylinder of the latter, is intended to be hollow, so that the boring operation will remove all of the mandril. *Patent completed.*

1109. J. Stanton. *Improvements in apparatus or machinery to be used in stamping or piercing metal washers and other similar articles.* Dated April 16, 1862.

Here the patentee uses a machine consisting of two punches and their bolsters, the one set at an angle of about 60 deg. with the other, bent in gear with each other. The metal having been supplied to the first punch, a blank is struck out, and this blank falls through an aperture in the bolster, which aperture is provided on one side with an inclined plane of stout glass, or other suitable material, which throws the blank to the bottom of a receiver below the bolster. In this position the blank is caught by a grip or catch, which retains it whilst the second punch perforates the blank. Upon the grip or catch receding, the washer falls out of the machine completed at one operation. The two punches may be geared together to work reciprocally by a connecting rod and lever, or in any other suitable manner. *Patent completed.*

1110. J. H. Johnson. *Improvements in machinery or apparatus for cutting the teeth of wheels, racks, or segments.* (A communication). Dated April 16, 1862.

This consists in the use of a cutter in the form of an endless screw, made adjustable to any desired angle, and composed of hardened steel, and having its surfaces file cut, or formed with cutting edges, so as to be capable of cutting or reducing metals. *Patent completed.*

1111. J. Ashbury. *Improvements in the permanent way of railways.* Dated April 16, 1862.

Here it is proposed to use a rail having the ordinary bearing flange at its upper surface, but with a slightly tapered or wedge-shaped web in transverse, the narrowest portion of the rail being at its lower edge. This rail is dropped into a chair, the inner surfaces of the jaws of which are made to approach each other towards the lower portion of the chair, thus presenting a tapered or wedge-shaped opening or trough for the reception of the corresponding tapered web of the rail, which fits it accurately at the sides. Any heavy weight passing over the rail will tend to force it down into its chair, and will, consequently, still further tighten it therein without the necessity for keys or wedges of any kind. If desired, a small wooden bearing piece may be inserted into the bottom of the chair to receive the direct pressure of the rail, but this may be dispensed with if preferred. The rails may be prevented from arising from their chairs by pins or bolts passing transversely through the rail and jaws of the chair, a ring or cutter serving to prevent the accidental displacement of the bolt; but in some cases these bolts or pins may be dispensed with. The joint chairs are made like the intermediate chains, but wider, and the bolt or pin is passed tnrough the two jaws and through an opening made between the rail ends, so that one bolt will serve to hold down both rail ends. It is preferred to form these chairs by rolling them from wrought-iron plates, but they may also be made of cast-iron if desired. *Patent completed.*

1112. J. H. Johnson. *Improvements in railway and common road carriages.* (A communication.) Dated April 16, 1862.

This relates to a peculiar mode of mounting railway and common road carriages upon their running wheels, and consists in mounting such vehicles upon wheels, rollers, or cylinders which rest at their peripheries upon the ordinary axles of the vehicle. The axles of the upper and lower wheels are by this system considerably reduced in diameter, and hence the friction is reduced, and a considerable saving of tractive power is obtained. The upper wheels are mounted in forked guide irons, which take the entire weight of the load, suitable springs being adapted thereto. The axles of the upper and lower wheels may be allowed to work freely within slots or springs made in the forked guide irons, and in some cases one or both of the lower wheels may be loose on their axle to facilitate turning or the passing over curves. *Patent abandoned.*

1113. J. W. Ford. *Improvements in sewing machines.* (A communication.) Dated April 16, 1862.

We cannot here give space to the voluminous details of this invention. *Patent completed.*

1114. J. Weston. *Improvements in machinery for morticing, drilling, and dove-tailing, and in tools to be used therewith.* Dated April 16, 1862.

We cannot here quote the details of this invention. *Patent abandoned.*

1115. C. D. Abel. *Improvements in the manufacture and production of the chromates and the bichromates of potash and of soda.* (A communication.) Dated April 17, 1862.

This consists in substituting sulphate of potash and sulphate of soda for the carbonates and nitrates of these bases as used at present in the manufacture, respectively, of the bichromate of potash and of the bichromate of soda. *Patent abandoned.*

1116. A. Krupp. *Certain improvements in the manufacture of screw propellers.* Dated April 17, 1862.

This consists in forming screw propellers in one piece, or in two or more pieces, from a solid block or blocks of cast steel, and forging the said block or blocks into the necessary shapes. Where it is desirable, for convenience or economy, to form the propeller in two or more pieces, the inventor forges the pieces from solid blocks of cast steel, and fits them together. *Patent abandoned.*

1117. V. Fleury. *Improvements in clocks and other timekeepers.* Dated April 17, 1862.

This consists in the construction of a novel escapement, which may be adapted to the usual clockwork. *Patent abandoned.*

1118. W. H. Hutchinson. *Improvements in the manufacture of ammonia, or its salts and cyanogen, or its compounds from refuse gluten.* Dated April 17, 1862.

In carrying out this invention, the refuse gluten from starch or other manufactures is subjected to destructive distillation in iron, clay, or other suitable retorts, and the gaseous products are condensed or collected in any way. From these products the pure ammonia is obtained by filtering and redistillation, or is crystallized by the addition of acids. The inventor obtains the compounds of cyanogen either by fusing the refuse gluten in a retort with potash, soda, lime, or other salts, or by passing the gaseous products from the first retort over red-hot charcoal, soaked beforehand in a solution of the required salt or salts. *Patent abandoned.*

1119. J. Griffiths. *Improvements in propelling ships and other navigable vessels.* Dated April 17, 1862.

This relates to that system of propelling by water where motive power, steam, or other engines are employed to work pumps or propelling cylinders, which take in and force out water. Thus the liners of the said ships or other navigable vessels, such water being ejected under the water line, at an angle or a direction towards the bow or stem, causing a vessel to move in the opposite direction to the ejected current ahead, astern, or otherwise, as desired. The pumps may be single or double acting, and are placed by preference athwart ship alongside acting engines in or about that part of the vessel deepest in the water. To each of the said pumps, if single acting, are two communications by tubes with the water outside the vessel, the terminations of which are made to direct the water taken in by the action of the pumps or propelling cylinders, and displacement of the vessel downwards and at an angle to the keel. In the tubes above named, or in or about the tubes or pumps, parts, or the whole of which may be covered with water, confined in a tight compartment, are throttle or other valves, so placed, and under the control of the engineer, that, by moving the necessary levers, he can alter or reverse the course of a ship without stopping or reversing the engines. *Patent abandoned.*

1120. W. Harling, J. M. Todd, and T. Harling. *Improvements in looms for weaving.* Dated April 17, 1862.

This relates to an improved brake and stopping motion, and consists in fixing the frog to a shaft, so that it may slightly turn or oscillate on a bearing, instead of sliding on the loom side as at present. To the shaft to which the frog is attached, there is a double or two-armed lever, having one arm shorter than the other. To the short arm is connected one end of the brake rod, the other end of which is curved to suit the fly wheel, and mounted with wood or leather in the usual way. The top of the long arm of the aforesaid lever acts upon the stopping handle or setting on rod, and, in consequence of its increased length, acts sooner upon the strap than upon the brake, and the strap is shifted to the loose pulley before the brake is in contact with the fly wheel. The brake rod is placed in an inclined position, so that by its own weight the brake may fall back from the fly wheel when the stop rod finger is not acting against the frog, and thereby prevent any possibility of the brake being in contact with the fly wheel until required. When desirable the patentee uses an oscillating frog, and also a stop rod finger, at each end of the loom, instead of at one end only; but in either case the stop rod finger and frog are placed in a direct line with the sword arm, and thereby prevent side strain or injuries. *Patent completed.*

1121. F. Tolhausen. *An improved machine for making bricks, tiles, and the like articles.* (A communication.) Dated April 17, 1862.

This consists of a strong metallic disc turning on a central pivot, and supported on its rotatory motion by castors or spherical balls that are arranged round the circumference like in a railway turn-table. There is a suitable number of moulds fixed all round on the disc, and the said moulds having been filled with the material in the ordinary way the disc is made to turn so as to bring the moulds successively under the action of one or several shaping or pressing plates that are arranged around and above the rim of the disc. The said pressing and shaping plates are acted upon by a screw and fly wheel, in the manner of a fly press. The disc may be moved by one or more fly wheels set tangentially in a vertical position, and acting either by friction or bevil gear. The said fly wheels by cams also act on plates for lifting the brick or other article out of the mould in which it has been compressed and shaped by the plates, as above described. *Patent abandoned.*

1122. J. Murphy, sen. *Improvements in looms.* Dated April 17, 1862.

This consists in applying to looms a floating race, to admit of two shuttles being actuated simultaneously. *Patent completed.*

1123. J. P. Temberley. *Improvements in the air-pumps of steam engines.* Dated April 17, 1862.

This consists in fitting a plunger or ram upon the piston-rod of the air-pump cylinders of condensing engines, or in otherwise connecting a plunger with the ordinary bucket. By this means, the action of the air-pump is increased, and a portion of its work performed during the down stroke, whereby the size of the air-pump may be reduced accordingly. *Patent abandoned.*

1124. G. T. Bousfield. *Improvements in sewing machines.* (A communication.) Dated April 17, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1125. J. L. Perin. *Improvements in machinery for mortising wood.* Dated April 17, 1862.

This consists in the use of a rose drill or fraise, to which the patentee imparts three self-acting motions: the first, a rapid rotary motion, for cutting away the wood; the second, a to and fro movement, which is determined by the length of the mortise to be cut; and the third, a penetrating motion, according to the depth of the mortise to be cut. The two latter motions, if necessary, can, however, be imparted by hand. The timber operated on remains stationary during the triple action of the drill. In order to square out a mortise hole thus obtained, he makes use of a right-angled tool, which is impelled by hand. He also attaches to the machine embodying the improvements in drilling machinery to pierce round holes preparatory to mortising, or for other purposes, if necessary. *Patent completed.*

1126. H. Gardner. *Improvements in machinery for breaking and preparing flax and other fibrous substances.* Dated April 17, 1862.

This consists in the combination of three plated rollers mounted in a suitable frame, one of such rollers in the front of the machine being mounted in elastic bearings, and the other two rollers being mounted in fixed or inelastic bearings. The material intended to be operated upon is fed into the machine on the upper side of the front roller, and is drawn in between it and the upper, whence it passes between the lower part of the said front roller and the lower roller, and is delivered on to a table or other receptacle in the front of the machine. The bearings of the front or feeding roller are rendered elastic by means of a spring fixed at each end of its axis, the elastic power of the springs applied thereto being varied to suit the particular material intended to be operated upon. The power, whether manual or mechanical, is applied either to the axis of the upper roller, or to that of the lower roller. *Patent abandoned.*

1127. C. D. Abel. *Improvements in the manufacture and production of certain alloys, containing cadmium.* (A communication.) Dated April 17, 1862.

This consists in the formation of alloys of gold, silver, and copper with cadmium. The alloys of silver, copper, and cadmium, besides being useful for various other purposes, are particularly adapted for forming into wire by drawing on account of their great ductility. The alloys of gold, copper, and cadmium are applicable to the manufacture of wire by drawing, and to jewellery generally. *Patent completed.*

1128. R. A. Brooman. *Improvements in taps and valves.* (A communication.) Dated April 17, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1129. R. A. Brooman. *Improvements in buffing apparatus and in drawing springs.* (A communication.) Dated April 17, 1862.

This invention consists in the employment of wedge-shaped blocks, connected to the buffer heads through their rods and a cross bar, or otherwise, and to the draw rods, which wedge-shaped blocks are pressed upon by springs directly, or by jaws acted upon by springs, in order that the ends of the springs or of the jaws may be kept in contact with the sides of the wedge-shaped blocks. There are various means of applying this invention, for instance—1st. A wedge or wedge-shaped block may be fixed on the back of the buffer head, and two rods or jaws may be fitted under the carriages, with the division between the two outer ends of such jaw, opposite or in a line with the point of the wedge, and with springs pressing upon the jaws, and exerting their force to keep the jaws closed until overcome by the superior pressure applied upon the buffer heads, when the wedge will gradually force the jaws apart. In some cases the wedge may be in the form of a spear head, and studs may be applied on the inner ends of the jaws in order to enter behind the spear head, and prevent the back action of the springs—a source of mischief in cases of collision from buffer apparatus as now generally constructed. 2nd. For some purposes, instead of having two buffer heads and appurtenances at the end of each carriage, the inventor sometimes employs only one buffer head, extending across the end of the carriage frame, and fits one wedge or wedge-shaped block at the back and in the centre thereof. He then only employs one set of jaws and springs. Again, he forms draw springs by applying at the back of the draw hook a similar wedge or wedge-block and jaws and springs, but in such case the point of the wedge is placed in the reverse direction. Sometimes he combines both draw spring and buffer apparatus in one by the employment of a double wedge or double wedge-shaped block, with a set of jaws and springs for each wedge or block. Again, he sometimes makes one set of springs act upon the buffers and draw hooks at both ends of the carriage. He connects the inner ends of the buffer rods at each end of the carriage to a cross bar, through the centre of which the draw rods pass, and he connects each of such cross bars and draw rods to a double wedge block. He then fixes two strong elliptical plate springs in such a position that the ends thereof shall enter the narrow parts of the two double wedge-blocks, and exert their pressure thereon. Thus, whether the draw hooks be drawn outwards, or the buffers be pressed inwards, the springs exert their whole pressure and prevent any evil effects and shocks, whether from the pull of the draw hooks or the thrust of the buffers. *Patent completed.*

1130. W. Anderson. *Improvements in tubular steam generators.* Dated April 17, 1862.

This consists in the means resorted to for fixing the bends which connect the ends of the tubes to each other. The tubular bends are each made with sockets to receive the ends of the tubes to each other. The ends of the tubes pass through iron plates, and the connecting of the ends of the tubes is external of the two end plates. The above description of steam generator is not new, but in place of fixing the connecting bends as heretofore, they are, by this invention, fixed by means of studs or rods with screwed ends, such studs or short rods being fixed to the plates, through which the ends of the tubes pass. *Patent abandoned.*

1131. H. Gallagher. *Improvements in overalls, leggings, or in overboots, which he intends to name "Gallagher's patent Ecreece."* Dated April 17, 1862.

This invention consists in constructing a boot of such dimensions that it shall be readily drawn on over the ordinary shoes or boots and trowsers, or leg and foot when dressed in the ordinary garments. And this boot the inventor makes with a sole of a peculiar character, it having, in fact, no sole beneath the "ball" part of the foot; and he prefers to make the toe-part of steel or iron, and the "waist" much lighter than in ordinary boots and shoes. Also to some height from the ankle a cut is made, and an elastic side-spring inserted with the view to facilitate the overboot being pulled on and off, and held firmly in position on the leg when in use. *Patent abandoned.*

1132. S. Rideal and R. Shepherd. *Improvements in railway-break apparatus.* Dated April 17, 1862.

The patentees claim the application of rods or bars moved longitudinally for the purpose of effecting communication throughout the several bars fitted to a train of carriages, and acting on the brakes as and for the purposes described, *Patent completed.*

1133. W. Clark. *Improvements in the manufacture of railway rails.* (A communication.) Dated April 17, 1862.

The patentee claims the improved methods for the acieration or mixed cementation of the upper parts of the casings of rails, which constitute the principal face of the rails. These new methods consist in protecting the said rails by coverings of sheet iron, or by the simple contact of the casings of the rail at certain parts of the surfaces, as described, instead of using argilatcions, or silicious earths, or slag, as in ordinary. *Patent completed.*

1134. J. C. Rivett and J. M. Hetherington. *Improvements in machinery or apparatus for preparing cotton and other fibrous materials for spinning.* Dated April 17, 1862.

This invention refers to the carding engine of that construction for which letters patent were granted to the above mentioned J. C. Rivett, dated 13th April, 1861 (No. 906), and consists, firstly, in an arrangement for causing the backward and forward motion of the rollers described in the specification of the said patent. For this purpose the patentees employ a worm and worm wheel, the former of which being caused to vibrate bodily, acts as a check, and causes the latter to turn upon its centre, so as to communicate motion to the rollers in both directions, and then the vibrating motion brings a click to act against a ratchet-wheel upon the axis of the said worm, whereby it is caused to revolve for effecting a necessary gain in the revolution of the rollers. Another improvement relates to the changes to be effected in the said description of carding engines, viz., firstly, traversing the strap to stop the feed. Secondly, Bringing the brush into action by reversing the cylinder. Thirdly, The starting again all these changes now derived from the loose pulley, and adapting a line shaft with cams thereon for the said purposes. Another improvement consists in forming the cleaning brush with rings, and in traversing it between each change, so that it acts upon a portion only of the cylinder at a time. Another improvement relates to the combs used in conjunction with the rollers as described in the specification of the aforesaid patent. These combs are stationary, but the patentees propose to traverse them in the direction of the axis of the said rollers, or to bring them into contact occasionally only. Another improvement also relates to these combs, and consists in using a portion only thereof when desired, and they therefore adapt them so that they may be readily removed. *Patent completed.*

1135. R. Wedgwood. *Improved apparatus for facilitating the saving of life in cases of fire.* Dated April 17, 1862.

This invention consists of a series of light or hollow rods, made of bamboo cane, metal tubes, or other light and strong material. These tubes or rods are provided at one of their ends with sockets, in which the ends of the other tubes are inserted, so as to form a rod of considerable length like a jointed fishing-rod. The topmost joint of this rod is provided with a hook or ring, on to which may be hung a small pulley with a cord, which may be thereby conveyed up to the persons in the upper floors of the house, and by means of this cord a basket, car, box, or other analogous contrivance, may be conveyed up to the persons in danger, who will then be able either to descend, or, by means of apparatus conveyed up to them, to assist in putting out the fire. *Patent completed.*

1136. R. Dennison. *Improvements in reaping and mowing machines.* Dated April 19, 1862.

This invention consists in the employment of shear-cutters arranged in alternate series upon and fixed to two laterally sliding bars or carrier frames, placed one above the other, the reciprocating lateral motion of the said bars to which the shear blades are fixed or hinged giving the requisite cutting motion thereto. *Patent completed.*

1137. E. Dove. *Improvements in matches and fusees, and apparatus for containing and igniting the same.* Dated April 19, 1862.

The matches or fusces are, according to this invention, made on one continuous strip or band, which is coiled up on a centre or small portion of wood or other material, and is inserted in a box or case of any shape or size, either for the pocket or otherwise. The outer end of this band is passed through an opening in the periphery of the case or other part thereof, and when drawn out through the opening it there comes in contact and passes under, over, or through one or more roughened or pointed igniting surfaces, which may be either a spring or otherwise, and in thus passing the composition with which each match is charged, becomes ignited, burning off, and leaving in the brand a sufficient length of match or fusee, and a sufficient portion protruding from the box or case by which the succeeding match may be likewise drawn out. *Patent abandoned.*

1138. J. S. Phillips. *A new method and apparatus for the propulsion of vessels through the water.* Dated April 19, 1862.

This invention consists in constructing wheels for the propulsion of vessels through the water with floats or propellers of a form resembling the hoof of a calf, or the foot of a cormorant, when that bird is propelling itself through the water. The number of propellers or floats that are applied to each wheel may be varied, but the patentee believes that, ordinarily, seven will be found a very convenient number. *Patent completed.*

1139. J. Shanks. *Improvements in apparatus for promoting ventilation, also applicable to drying stoves.* Dated April 19, 1862.

In practically carrying out this invention, in the case of a room or building, for example, separate tubes or passages are provided for the inlet and outlet currents, such tubes

being placed as far apart as is convenient. The inner opening of each outlet tube is in or near the ceiling or roof of the room or enclosed space, and the tube is carried up to a height that its top end is considerably above the level at which it is convenient to have the top of the inlet tube or tubes. The inner opening of each inlet tube may be at any convenient or desired level in the room or enclosed space, excepting above the level of the outlet openings. When the temperature within is from any cause slightly raised, there is a warm and consequently light column of air in the elongated outlet tube, which is counterbalanced by the colder and heavier air in and above the inlet tube, and the latter descends and a current is thereby established. *Patent abandoned.*

1140. M. MASTERS. *Improvements in artificial legs.* Dated April 19, 1862.

This invention consists of an improved hinge or joint for artificial legs. It is made of metal, or other suitable material, and instead of being solid, as at present, it has a hole or perforation in the centre, or at the part corresponding with the condyle or bone at the inside of the knee. Each joint is made of large diameter for the purpose of obtaining strength and steadiness, and the two shoulders and internal part of the joint are kept together by turning or hammering over the ends of a short tube into countersinks formed at the edges of the holes in the shoulders. *Patent abandoned.*

1141. R. and J. STUART, and H. HILL. *Improvements in fastening flyers upon spindles.* Dated April 19, 1862.

This invention consists in forming a deep spiral groove in the top or head of the spindle, whether the top or head be made tapered or not, and whether with or without a shoulder, and in fixing inside the tube, from which the flyer legs extend, a stud or projection to enter the groove in the spindle top or head. The patentees sometimes make a different shaped groove, but in all cases of such shape, that, by being taken into by a pin or stud inside the flyer tube, a sufficiently secure fastening is made to keep the flyer on the spindle. Sometimes they reverse the groove and stud, that is, they make the groove in the flyer tube, and form the pin or projection in the spindle top or head. The great advantages arising from the means of fastening above described, consist in the facility thereby afforded of "doffing," or taking off and replacing the flyers, and the time saved in that operation as compared with the ordinary means of fastening. *Patent completed.*

1142. B. RHODES. *Improvements in the machinery for, and in the method of, making, also in the materials to be employed in the manufacture of cylinders, tubes, and other vessels from paper and other materials or fabrics.* Dated April 19, 1862.

We cannot here give space to the voluminous details of this invention. *Patent completed.*

1143. W. MUNN and D. BALLANTINE. *Improvements in mills for grinding.* Dated April 19, 1862.

Under one modification or form of arrangement, the mill is supported on a framing of cast-iron, forming a table on which the hopper and grinding apparatus is arranged. At the lower part of the framing, and extending across it, is fitted a horizontal stay piece, which forms a footstep bearing for a central vertical shaft. This shaft passes up through the centre of the table, and its upper extremity revolves in a collar bearing fitted in the lower part of the hopper, the shaft passing through a box within which the grinding discs are arranged horizontally, and rotating one above the other; they are by preference formed of iron, with radial or other grooves in the working faces. The upper disc is fast to the central shaft, and the lower disc is carried on a tubular shaft which works outside the other. The central shaft is provided with the means of adjusting the distance of the discs one from another. This is done by means of a screw fitted at the lower end for raising or lowering the shaft. Motion is given to the main shaft from a driving shaft actuated either by hand or power; near the inner end of this shaft is fitted a bevel spur-wheel, which gives motion to a pinion on the vertical shaft. On the extremity of the driving shaft, and inside the main spur-wheel, is a second bevel-wheel which actuates the tubular shaft carrying the other grinding disc. It is preferred to actuate this disc at a lower speed than the upper one, and, when required, the shaft may be readily thrown out of gear by sliding the pinion up the feather formed on the tubular shaft. The materials to be ground are fed in through the hopper in the usual way, and pass down between the grinding discs, where they are subjected with more or less severity to the triturating action, according to the adjustment of the discs, which is suited to the material under operation. *Patent abandoned.*

1144. B. BROWNE. *Improvements in breech-loading fire-arms.* (A communication.) Dated April 19, 1862.

In carrying out this invention the inventor forms the outside of the breech end of the barrel enlarged, and chambers such part out, leaving a long opening at top into which a hollow piece of metal is fitted and connected to the barrel by a pin or screw; the upper side of this hollow piece of metal is fitted with a nipple, which is placed in a line with the centre of the barrel; a swell or projecting flange surrounds the said nipple, and serves to raise the aforesaid hollow piece out of the barrel for inserting the cartridge therein; the aforesaid, flange is extended so as to cover the openings between the sides and end of the chamber and hollow piece aforesaid, when inserted therein, the said hollow piece being locked to the barrel by a spring bolt taking into a hook fixed to the under side of the hollow piece aforesaid near the front thereof. In connection with the aforesaid spring bolt is a trigger which protrudes slightly through a slit in the under side of the stock of the gun in front of the ordinary trigger; a spring is also adapted to the under side of the before-mentioned hollow piece to assist in raising the same when the spring bolt has been withdrawn therefrom by the trigger thereof. *Patent abandoned.*

1145. E. LOYSEL. *Improvements in locks and fastenings.* Dated April 19, 1862.

In some of the locks described in the specification of a former patent, dated 17th July, 1860 (No. 1731), two, three, or more, divided cylinders were employed, and in the ends of these cylinders were made holes to receive a series of pins, on the face of a circular plate attached to the central spindle. A number of false notches, or holes, as well as the proper notches to receive the pins, were made for the purpose of deceiving any person who attempted to pick the lock. It has been found, by experience, that a skilful person can, with care, discover (by feeling) where the pins should be placed, and need not be very greatly deceived by the false notches. The object of the present invention is to obviate this objection, and to give unqualified security to the lock, so as to render it impossible, by merely feeling, to place the parts in their proper position. By the first improvement the patentee is enabled to dispense with the false notches or holes on the cylinder, and he adapts to the latter sets of pins, which correspond with holes made in two circular plates, one of which may be rotated, while the other is secured to the central spindle and other parts in such manner that it cannot rotate, but will remain stationary until the spindle is drawn back. Another improvement consists in dispensing with the pins on the spindle plate, and employing, in combination with the latter, a rotating plate, in both of which plates coincident holes are made to receive the pins of the cylinders. In the former invention the pins on the spindle-plate were of different lengths, depending upon the position of the cylinders; but in the improved lock, all the pins of all the cylinders are made with their outer ends in exactly the same level, so that their position, in reference to the holes in the circular plates, cannot be felt or known until all the pins of all the cylinders are brought into the proper position for unlocking the bolt. The rotating plate in which the holes are made is actuated by means of a pin fixed in either of the cylinders, and this plate is placed within the flush pins and the holes, so that, until the holes in both plates are brought into coincidence, the pins cannot be inserted. These locks may be adapted to various purposes, either for safes, drawers, and portmanteaus or bags, where security is required. *Patent completed.*

1146. W. ROSE. *Improvements in the manufacture of tubes, more especially applicable to the barrels of firearms and ordnance.* Dated April 19, 1862.

In carrying out this invention, with reference to the making of barrels of firearms and ordnance, the patentee takes a strip, band, or skeep of iron or steel, or a mixture of both, and passes it through grooves to the requisite section in a train of rolls, or through dies on a draw-bench, by which operation the metal is turned up into a form nearly approaching a complete tube; or it may be completely formed into a tube, and securely welded by the rolling process, or in the dies if necessary. He then cuts this tube, or partial tube, into lengths suitable for the purpose, for which the barrel may be ultimately intended, which, for a small arm, such as a rifle, would be about 1 ft. each length. Upon each of these short tubes he proceeds to twist a band or bands, strips, or ribands of iron or steel, or both combined, forming such bands into a rough coil upon the inner lining tube. He then heats the whole mass, and takes it from the furnace upon a stop mandril, and jump it, if necessary, to close the coil. He then takes it, at a welding heat, upon an ordinary roller mandril, to a train of ordinary gun rolls, passing it through the grooves in such rolls once, twice, or three times, as may be requisite, the use of the mandril and the rolls insuring internal as well as external pressure. By this process the tube is drawn out, and each coil of the twist is securely welded upon the inner lining tube, and also edge to edge upon its adjoining coil, and in its last passage through the rolls by employing temporary common barrel rollers or tapering mandrils, the necessary taper required in a small arm barrel or piece of ordnance is given to the tube. Should one band or coil upon the inner lining tube afford insufficient thickness for the barrel, he coils back upon the former more bands, until a sufficient thickness of metal has been insured. This operation is, of course, performed before beating or welding the mass together. In making ordnanse and heavy guns, he employs the same process, but with more material and suitable mechanical appliances for dealing with heavier weights. After having coiled the strip or bands upon the inner or lining tube, he heats the mass, and, if necessary, removes it upon a stop mandril to what is known in the trade as a jumping machine, in which, under heavy blows from a forge or steam hammer, or other suitable apparatus, the coil is closed up edgeways. He then reheats it, and takes it upon a mandril to the rolls, which, for this purpose, require to be of a very strong description. By passing through the grooves of the rolls the coil or coils are welded firmly on the tube by the internal and external pressure. In the manufacture of tubes other than those employed for firearms or ordnance, he adopts the same process already described, omitting the taper rolling, unless taper tubes are required. Tubes may also be made by this process of other metals than iron or steel, and for other purposes than the barrels of firearms or ordnance, provided the metal be capable of being welded or united by heat. *Patent completed.*

1147. A. PARKES. *Improvements in the manufacture of rollers for surface printing and embossing.* Dated April 19, 1862.

Here the patentee casts the liner or inner roller hollow interiorly, so that it then fits the mandril only at each end, or, if greater strength is required, a central bearing surface may also be provided. He makes the liner of cast iron, or, preferably, of cast steel. At the places where the liner fits upon the mandril, he in some cases bushes it by preference with copper or brass. He secures the roller on the mandril by a solid nib or projection left on the side of the hole through which the mandril passes; this nib enters a recess or key way cut for it in the axis. When the liner is bushed with copper or brass, the nibbing may be effected by a machine similar to that commonly used in nibbing copper rollers; but when the liners are not so bushed, he forms the nib by a machine of which the cutting tool rises and falls vertically in the manner of a slotting machine, as the machine ordinarily used for nibbing copper rollers will not cut iron efficiently. *Patent completed.*

1148. A. W. WORNUM. *Improvements in pianofortes.* Dated April 19, 1862.

Horizontal pianofortes are usually considered to be, in many respects, preferable to upright pianofortes, but they have the disadvantage of occupying a much larger space. Now, according to this invention the patentee furnishes a horizontal instrument with axes or trunnions about which it is balanced. The frame receives these axes or trunnions in suitable bearings, and it is so constructed, that the instrument may be turned about on its trunnions, either to bring it into a horizontal position for use, or to place it in a vertical position, so that when out of use it may occupy even less space than an ordinary upright instrument. The invention also consists in an improvement on the horizontal pianoforte action, described in the specification of a former patent granted to the present patentee, dated 11th July, 1856 (No. 1,644). In this action the key gives motion to one arm of a bell crank lever, to the other arm of which the fly or hopper—which acts on the hammer butt, and actuates the hammer—is jointed; the damper is actuated by a rod passing from the extremity of the arm of the bell crank lever which carries the fly over and above the hammer, to another bell crank lever carrying the damper, which is thus actuated. The present improvement consists in bringing the damper action between the hammer and the string, which he is able to do by attaching a projecting piece to the bell crank lever, which is actuated by the key; this projecting piece is carried by the under side of the arm thereof, on which the key acts, and when the key is depressed it comes in contact with another projecting piece on a straight bar mounted on a centre at one end, and carrying the damper at the other; the projecting piece on this lever being acted on as above described, causes the lever to turn on its centre and the damper to be raised. *Patent completed,*

1149. A. PARKES. *Improvements in surface condensers.* Dated April 19, 1862.

This consists in coating the tubes with silver by an electro-plating process. The tubes may, with advantage, be silvered both inside and out; the principal advantage, however, is, the patentee considers, obtained by silvering the surface with which the steam comes in contact. In plating the tubes the patentee employs the ordinary electro-plating process, a silver bath to receive the tubes being made use of. He prefers to use a coating of silver equal to from 30 to 40 grains per square foot of surface. *Patent completed.*

1150. H. LUMLEY. *An improved rudder.* Dated April 19, 1862.

Here the patentee constructs a rudder in two moveable portions, connected together edgewise, the outer or further portion, which he calls the "tail," being at the outer end of the inner or hither portion, which he calls the "body," the two portions are hinged-jointed, so that, when the body is moved, turned, or worked to steer the ship or vessel, the tail also turns or works at the end of the body, and assumes various angles with respect thereto. *Patent completed.*

1151. A. P. TROUCHOW. *An improved construction of houses, murals, mobil palisades, fruit walls, and other analogous objects.* Dated April 21, 1862.

This consists in forming the pieces of the framework of houses of wood, cast or forged iron, and the parts which are to be full with an iron wire lattice or trellice, and also of wood, in certain cases covered with plaster or other suitable material; the parts representing the walls are double, with a space between them to form the thickness of the walls. These spaces may be filled with sand or other materials, or with the earth dug up for forming the foundation or cellars. The partitions may be made of single trellis, without forming two thicknesses. The uprights composing the framework support the parts forming the floors composed of iron lattice, which, being coated with plaster, forms the ceilings. *Patent completed.*

1152. J. COMBE. *Improvements in machinery for hackling flax and other fibrous substances.* Dated April 21, 1862.

This relates to an improved arrangement for connecting the hackles to the sheets, or substitutes for sheets, of vertical or other hackling machines, by which the patentee is enabled to obtain control of the angle which the hackle pins make to the material under operation when they first penetrate it, while they are passing through it, and while they are returning to repeat their action. The invention, therefore, allows of the hackle pins being put in the best position for acting on the flax, and also of their being made to leave the flax at such an angle that the two is left behind them. *Patent completed.*

1153. E. H. C. MONCKTON. *Improved apparatus to be used in warfare, parts of which are applicable to other useful purposes.* Dated April 21, 1862.

The use of electricity and of the above processes as applied to the preparation of iron, steel, and other improved metals to be used in the construction of cannon rifles, armour plates, and other objects used in naval or military warfare, or otherwise as described. *Patent completed.*

1154. J. PICKARD and T. MORRIS. *Improvements in furnaces for the prevention or consumption of smoke.* Dated April 21, 1862.

This consists of a means of effecting or causing the consumption of coal in furnaces, by admitting common air to the front part of the bridge of the furnace in quantities proportioned to the amount and quality of fuel consumed. The air is supplied through the ash-pit, or otherwise to the bridge of the furnace by tubes, doors, or other passages, and passing out of the front part of the said bridge by an opening or openings therein, mingles with the gases and smoke or other products of combustion before their passing over the bridge, causing the perfect ignition or consumption of the same, and effectually prevents the escape of any unconsumed combustible matter through the flues or chimney. *Patent abandoned.*

1155. S. P. MATTHEWS. *Improvements in vices.* Dated April 21, 1862.

This invention consists, firstly, in dispensing with the box and pin, and in lieu thereof applying a pair of portable side plates, in which is fixed a screw lever, the said plates bearing upon side rollers attached to the moveable jaw or

front frame; the aforesaid plates are pierced with pin-holes for regulating the width of grip. Secondly, in attaching to the front jaw or moveable frame three pairs of small pulley wheels, over which a small weight is slung by means of string, catgut, or other material, the weight being a substitute for the spring, but acting on the moveable jaw, or front frame, insures an undeviating power, no matter to what extent the vice is opened. *Patent completed.*

1156. S. F. GRIFFIN. *Improvements in the construction of vessels of war and batteries on land.* Dated April 21, 1862.

In carrying out this invention, the inventor constructs a strong cylindrical-shaped framework, containing in a suitable position a strong gun platform. The upper part of this framework will be dome-shaped, and protected by strong armour-plates of iron or other metal; the lower part may be carried deep into the vessel, and divided, as convenience may direct, into compartments as depots for shot and munitions of war. This framework is suspended by trunnions on a strong circular ring, and such ring or horizontal circle is again suspended by trunnions (similar in principle to the suspension of a ship's binnacle) on a second ring resting on the framework of the vessel, with intervening rollers admitting of the easy rotation of the framework with its gun platform and rings by any suitable gearing. Of course, more than one framework can be fixed in each vessel, and more than one gun on each framework. By these arrangements the inventor expects to obtain the means of keeping the gun platform parallel with the water, independently of the ship's motion, and neutralise to a considerable extent the effect of the gun's recoil, and the impact of shot on the exposed part of the framework. When a vessel is not in action (or from its being so desired), the framework might be prevented from oscillating with suitable fastenings. With some evident modifications, the principle of the improvements hereinbefore set forth may be applied to a land battery. And instead of the binnacle principle of suspension that of the cup and ball may be used for maintaining the equilibrium of the gun platform. The entire outer casing of the gun platform may be lifted up and lowered by steam power or screw power, or other means, so that a gun or guns may be loaded from below, or while below deck line, and the platform elevated and gun pointed, and discharged above the line, or on deck. *Patent abandoned.*

PROVISIONAL PROTECTIONS.

Dated July 11, 1862.

1998. W. Ashton, Manchester, Lancaster, machinist. Certain improvements in machinery employed in the manufacture of braids and similar articles, parts of which improvements are also applicable to machinery used in spinning fibrous substances.

Dated August 27, 1862.

2373. J. A. Coffey, Providence-row, Finsbury-square, and T. Redwood, Montague-street, Russell-square, Middlesex. Improvements in the manufacture of salts of ammonia and other products from the ammoniacal liquors of gas works and animal charcoal works, and in the still or apparatus to be used in such manufacture.

Dated September 25, 1862.

2611. R. Alexander, Islington, Liverpool. Improvements in mariners' compasses.

Dated October 13, 1862.

2760. E. B. Wilson, Parliament-street, Westminster, engineer. Improvements in apparatus employed in the manufacture of iron and steel.

Dated October 15, 1862.

2776. E. Molyneux, jun., Leavien Enniskery, co. Wicklow, Ireland. An improved carriage, with a travelling railway attached.

2778. J. H. Jenkinson, Manchester, cotton spinner. Certain improvements in drink ng fountains.

Dated October 16, 1862.

2795. F. Delmas, Cloak-lane, London, gentleman. A rain absorber.

2802. E. Nelson, Johnson's-place, Ranelagh-road, Thames-bank, chemist. Improvements in the manufacture of apparatus for heating and superheating steam and air without decomposition.

Dated October 20, 1862.

2819. G. Haseltine, Fleet-street, London. Improvements in forging cannon and other heavy articles. (A communication.

2821. J. Clark, Buchanan-street, Glasgow. Improvements in the means of applying railway brakes.

2822. N. R. Hall, Rosherville, Northfleet, Kent, and M. I. Parnell, Strand, Middlesex. Improvements in the construction of thermometers.

2823. W. A. Turner, Lawrence Pountney-lane, London, and T. T. Coughin, King's-place, Stones' End, Borough, Improvements in apparatus for measuring cloths and oth r fabrics, parts of which are also applicable to indicating distances travelled by vehicles.

2825. H. L. Emery, 72, Sloane-street, engineer and manufacturer. Improvements in propelling machinery actuated by the application of animal power.

Dated October 21, 1862.

2828. W. Tristram, Bolton, manufacturer. An improved method of, and apparatus for, preparing and dressing yarns or threads to be employed as warps.

2829. W. H. Tucker, 181, Fleet-street. Improvements in self-closing apparatus for doors.

2831. S. Whitham, iron manufacturer, and T. Wright, manager, Calder Vale Iron Works, Wakefield. Improvements in the manufacture of iron and steel, and in the apparatus employed for that purpose.

2833. C. Clark, 361, City-road. Improvements in cigar tubes, and in cigar and pipe mouth-pieces.

2835. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in waterproofing and in recovering products employed therein. (A communication).

2837. J. Duke and J. Clever, Puriton, Somerset. Improvements in the manufacture of cement.

2839. F. Tolhausen, 17, Faubourg Montmartre, Paris, civil engineer. An improved machine for raising, lowering, removing, and carrying buildings, monuments, and ships or vessels. (A communication.)

Dated October 22, 1862.

2841. G. Clark, 30, Craven-street, Strand, gentleman. Improvements in the construction, protection, and armament of ships, vessels, and floating batteries, some of which improvements are applicable to land batteries and forts.

2842. J. Spence, Her Majesty's Dockyard, Portsmouth, engineer. Improvements in nonconducting compositions for preventing the radiation or transmission of heat or cold, and in coating metallic and other surfaces therewith.

2844. E. Fielding, Willow Bank, near Todmorden, mechanic. Improvements in the manufacture of healds, and in the machinery employed therein.

2845. H. Wilde, Manchester, engineer. Improvements in electro-magnetic telegraphs.

2846. H. H. Kromschroeder and J. F. G. Kromschroeder, Princess-terrace, Regent's-park. Improvements in the manufacture of gas meters, and in the manufacture of sheet metal suitable for gas meters.

2847. E. W. Hughes, 28, Great George-street, Westminster, civil engineer. Improvements in turn tables and turn bridges.

2848. T. Fearn, Birmingham, electro-metallurgist. Improvements in the manufacture of rods, poles, tubes, and other forms employed in the construction of various articles of furniture, and for other similar purposes.

2849. T. Greenwood, Leeds, machine maker. Improvements in machinery for preparing to be spun, flax, hemp, tow, silk waste, China grass, and other fibrous substances.

2850. V. Orlowski, Spring-gardens, Worcester. Improvements in motive power carriages.

Dated October 23, 1862.

2852. W. S. Gamble, Frederick-street, Caledonian-road, Islington. An improved salinometer.

2854. J. Turnbull, Barnard Castle, Durham, brass and iron founder. Improvements in mills for grinding grain.

2856. E. Bath, Port Tennant Copper Works, Swansea. Improvements in treating alkali waste to obtain sulphur therefrom.

2858. H. Rée, Hamburg. Improvements in apparatus for exercising the human body.

2860. E. H. Carbutt and G. A. Clough, Bradford, engineers. Improvements in power hammers.

2862. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in tanning. (A communication.)

Dated October 24, 1862.

2864. C. C. Burmeister, and W. Wain, engineers, Copenhagen. Improvements in the construction of "cupolas," and in apparatus connected therewith, for naval or other war purposes.

2866. J. Gimson, engineer and machinist, and R. Flude, loom maker, Leicester. Improvements in looms for weaving narrow fabrics.

Dated October 25, 1862.

2876. J. A. Nicholson, Gracechurch-street, gentleman. Improvements in lead, crayon, and other pencils.

2878. A. Clark, Brighton. Improvements in the construction of bows and pendants of watches.

2882. J. P. Bourquin, Newman-street, Oxford-street, album manufacturer. An improved manufacture of mount for photographic and other albums, miniatures, and other pictures.

Dated October 27, 1862.

2884. J. H. Johnson, 47, Lincoln's-inn-fields, gentleman. Improvements in rotatory engines. (A communication.)

2890. F. L. H. W. Bünger, 5, Gloucester-place, Brixton-road, civil engineer. Improvements in self-acting apparatus for discharging the water resulting from the condensation of steam. (A communication).

2892. P. E. Placet, Cite Gaillard, No. 5, Paris, civil engineer. An improved process of engraving.

2894. A. Peek, Manchester, manufacturing chemist. Improvements in apparatus for evaporating saccharine and saline solutions.

2996. J. Howie, Hurlford, Ayr, coal master. Improvements in machinery or apparatus for regulating the supply of solid or liquid bodies to mills. or other apparatus used in mixing or preparing plastic matters.

Dated October 28, 1862.

2898. E. Hooper, Southampton. Improvements in roofing tiles.

2900. E. and A. Tatham, Ilkeston, Derby, lace manufacturers. An improvement in warp machines for the manufacture of looped fabrics.

2906. T. Sutton, Bachelor of Arts, St. Brelade's Bay, Jersey. Improvements in preparing albumenized paper for photographic purposes.

Dated October 29, 1862.

2916. W. E. Evans, 8, Newton-terrace, Bayswater. Improvements in apparatus for playing organs, harmoniums, pianos, and other similar keyed instruments, and also improvements in reed musical instruments.

2918. W. E. Gedge, 11, Wellington-street, Strand. Improvements in looms for weaving. (A communication.)

2920. J. Head, Steam Plough Wharf, New Swindon, Wilts, engineer. Improvements in machinery employed when cultivating land by steam power.

2922. F. L. Stott, Rocndale, machine maker. Improvements applicable to mechanism or apparatus for warping yarns or threads.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

Dated October 30, 1862.

2935. G. Haseltine, 100, Fleet-street. Improvements in horse shoe machines. (A communication.)

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

1897. G. H. Hulskamp. Pianofortes.

1905. J. Wall, and T. Dodd. Taps for controlling the flow or passage of fluids.

1915. E. F. Prentiss. Construction of omnibusses and other four-wheeled vehicles.

1918. C. Lungley. Constructing, building, and working floating docks and other floating bodies.

1920. J. and J. Greenhalgh. Diminishing valve.

1923. W. E. Newton. Washing wool. (A communication.)

1929. T. L. Atkinson. Stewpans.

1930. G. H. Hulskamp. Violins.

1931. J. Murray. Portmanteaus.

1932. J. Steel. Water closets.

1933. J. Crisp, and J. W. Elliott. Apparatus for burning American rock oil.

1935. G. Bedson. Rolling wire and other rods or bars of metal.

1936. J. M. Hetherington, and T. Jackson. Preparing, spinning, and doubling fibrous materials.

1939. W. A. Gilbee. Manufacture of blue colouring matter. (A communication.)

1943. J. Miles. Cutting out soles and other parts used in the manufacture of boots and shoes.

1945. W. J. Cunningham. Sewing machines.

1946. A. Drevelle. Apparatus for laying cards or sheets of metal into woven or textile fabrics.

1948. J. Howard and J. Bullough. Warping and beaming machines.

1953. A. Warner. Preparing materials for, and in purifying coal gas.

1960. W. Spence. Telegraphic apparatus. (A communication.)

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed November 7, 1862.

1387. G. F. Greiner and J. H. C. Sandilands.
1403. W. Clark.
1404. R. Moore.
1405. R. Moore.
1406. J. T. Cooke.
1409. J. House.
1416. J. Milnes.
1417. G. Fuhrmann.
1421. H. S. Firman.
1424. H. Cartwright.
1425. W. N. Hutchinson.
1426. C. J. Neale.
1427. H. Ashworth.
1429. A. B. Freeland.
1435. P. M. Lopez.
1447. W. Southwood.
1457. E. Whitttaker, and J. Clare.
1469. G. H. Birkbeck.
1472. J. Wright.
1485. A. L. Thirion.
1518. M. A. F. Mennons.
1527. J. Kennedy.
1539. J. Oxley.
1616. W. Perks.
1827. B. Fabbricotti.
2077. T. Meriton.
2145. Z. Colburn.

Sealed November 11, 1862.

1453. R. A. Brooman.
1456. A. Smith.
1459. J. Smith, sen.
1468. W. Sissons.
1470. J. Stone.
1474. C. Tress.
1475. I. Baggs, and W. Simpson.
1477. A. Watney.
1482. R. Laming.
1486. F. B. Anderson.
1493. B. Sharpe.
1494. A. V. Newton.
1495. A. V. Newton.
1500. J. Hogg.
1501. J. Broadley.
1507. J. C. Gore.
1517. A. V. Newton.
1551. W. Roberts, and T. Greenacre.
1554. P. McGregor.
1565. J. Harrison, and R. Parkinson.
1566. W. and J. Harrison, and J. Oddie and W. Parkinson.
1595. C. H. Hudson.
1631. H. P. Burt.
1645. H. Watson, and J. Millbourn.
1655. J. King, and J. Partington.
1670. G. Gurney.
1708. A. V. Newton.
1763. W. E. Newton.
1764. W. E. Newton.
1911. W. E. Newton.
2093. C. J. Keene.
2343. C. Monson.
2345. E. S. Ritchie.
2488. F. Hands, and H. Holland.
2602. W. Clark.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2518. J. Chesterman.
2546. J. Hamer.
2526. W. Mannix.
2543. G. Hadfield.
2553. E. T. Hughes.
2567. R. Lansdale.
2538. A. Learch.
2563. T. Blinkhorn.

PATENT ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2582. C. Crum, and C. Paul.

LIST OF SPECIFICATIONS PUBLISHED

For the Week ending November 8, 1862.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s. d.		s. d.		s. d.		s. d.		s. d.		s. d.
871	0 4	882	0 4	892	0 10	902	0 4	912	0 4	922	0 8
872	0 8	883	0 4	893	1 6	903	0 6	913	0 8	923	0 4
873	0 10	884	0 8	894	0 8	904	0 8	914	0 8	924	0 10
874	0 4	885	0 4	895	0 4	905	0 4	915	1 4	925	1 4
875	0 10	886	0 4	896	0 4	906	1 0	916	0 4	926	0 6
876	0 4	887	0 4	897	0 8	907	0 8	917	1 4	927	0 4
877	0 4	888	0 4	898	0 4	908	0 4	918	0 4	928	0 10
878	0 4	889	1 6	899	0 8	909	0 4	919	0 4	929	1 8
879	0 4	890	0 4	900	0 4	910	0 8	920	1 2	930	0 6
880	0 4	891	0 4	901	1 6	911	1 4	921	0 4	931	0 10
881	0 4										

THE

MECHANICS' MAGAZINE.

LONDON, FRIDAY, NOVEMBER 21, 1862.

NAVAL GUN AND ARMOUR EXPERIMENTS AT SHOEBURYNESS.

The experiments which took place last week at Shoeburyness, in their character and results, are the most important and interesting which have occurred. They have a double bearing on our national defences, relating as they do to naval guns and naval armour. The significance attached to them in the highest quarters, and especially by our rulers, may be inferred from the *quasi* official reports in the *Times*, and the apparent spirit of candour, in which a leading article in that journal affects to do justice to Mr. Whitworth. It will be remembered by those, who have read the former reports of artillery and target experiments, which from time to time appeared in the columns of our great daily contemporary, that those occurrences were made the occasion of fulsome and extravagant panegyrics on the Armstrong ordnance or the "Warrior's" armour. The gun and the frigate were, in stilted language, declared to be unrivalled, and the country was again and again congratulated on the fact, that the possession of the one and the other gave England the pre-eminence over all other nations. We have often had occasion to point out the inaccuracy of those statements, and have warned our readers against placing full credence in them. We were well aware the real object of these laudatory reports and leaders was to support the two favoured Government enterprises, the Armstrong and "Warrior" pets, and "*coute qui coute*," to maintain their fading reputation. It was uphill work for the poor journalist. In spite of his efforts, he could not conceal facts published in the Mechanics' Magazine, which proved that the 110-pounder rifled Armstrong was less damaging than the old 68-pounder smooth bore, and that the "Warrior" armour was an imperfect defence against heavy guns. We joined in, if we did not lead the cry of indignation, spread far and wide, at the partiality, which was a barrier to the trial of better guns and better armour. Time and perseverance have at last wrought a beneficial change, and the results of recent experiments have lowered the boastful attitude of the official organs to one of humility and common sense.

We make these remarks as an introduction to our account of the gun and armour trials referred to, in order that the public may understand the real nature of the situation, with reference to two branches of expenditure, which have already cost the country more than six millions, to very little good purpose. It may be said, that the Government's difficulty is the nation's opportunity, which gives a chance to the economical party to strike home, and put a stop to wasteful expenditure on a monstrous scale.

In some of the leading features, and many of the details, our reporter's description of the trials at Shoeburyness, on Thursday and Friday last, differs materially from the reports of the *Times*. We invite attention to those differences, because they indicate, on the part of the Armstrong and Ellswick party, a determination not to give up the game as lost, but, on the contrary, by new combinations, to maintain their grasp on the public purse. The *Times* tells us, "Sir William Armstrong is not idle, and appears satisfied with the results" of some experiments which came off on Friday, when Mr. Whitworth and his friends were absent.

The authorities having, from circumstances, found it impossible to evade a fair trial of the Whitworth ordnance, the essential business on the first day (Thursday) was to measure the force of the Whitworth guns and projectiles against the Armstrong. The *Times'* reporter, following his cue, represents those trials as a duel between Guns and Armour. They no doubt have served to prove conclusively the radical weakness and total inefficiency of the "Warrior" system, which we have so often explained and insisted upon; but the real question at issue was the performance of the Whitworth, as compared with the Armstrong Artillery. The intense interest displayed by Sir William in the effect of every shot, proves how closely he felt the trials of that day concerned him; and he evidently felt, like everybody on the ground, that this was a contest for supremacy between him and his rival—that it was, in fact, the very crisis of his fate. The target fired at was only the medium for the experiments, although the results produced upon it have an astounding influence on the Naval Armour question.

The target set up for the occasion has been reported as similar to that of the "Warrior" section, but it differed in some particulars, and upon the whole was stronger, so that the chances were slightly against Mr. Whitworth. The backing, 18 in. of teak, was the same as that of the "Warrior," but the frames were closer together by 3 or 4 in., which gives greater support to the skin and backing; two of the three plates, which covered the target, each 3 ft. 4 in. wide, and about 15 ft. long, were 5 in. thick, being an advantage over the "Warrior" of ½ an inch.; and the ends of the target were supported by 7 ft. of balks of timber, against which the frames and skin abutted, and were secured in the most solid manner, the whole being shored up behind by stout wooden struts and stauncheons. The side supports, which added greatly to the power of resistance of the structure as a whole, and were not used in any previous target, formed the side walls of a chamber at the back, which was closed in behind and represented a portion of a deck with its ceiling and floor, access to it being provided for by an iron-plated door. The target, therefore, was stronger than the "Warrior" section, against which the Armstrong 100-pounders were fired without penetrating the plates, and the test was so much more difficult for the Whitworth experiments. The two 5 in. plates were part of the Samuda dismantled target, which so signally failed some months ago. The 4½ in. plate was one of the old "Warrior's." The former were rolled and made by J. Brown and Co., of Sheffield; the latter was hammered and made at the Thames Works. The iron of all three was of excellent quality. The 5 in. plates were fastened with through bolts, 9 in. apart, along the edges, longitudinally—not, as the *Times'* reporter surmised, to avoid perforations through the middle of the plates, but simply because they were so prepared on Mr. Samuda's plan, which, before his target was tried, we pointed out as a source of weakness, (on trial, it proved to be so,) in consequence of the perforations being within 2 in. of the edges of the plates, and, therefore, exposing them to easy fracture.

Two Whitworth guns were tried—a 120-pounder at 800 yards, a 70-pounder at 600 yards range, both rifled muzzle loaders. The rifling of the guns, and consequently the form of the projectiles, shot or shell, is a spiral hexagon, although for the matter of any difference in penetrating effect, the shells may be regarded as shot, for they do the work of penetration equally well, but they differ in length, being elongated to form the chamber for the bursting charge. The diameter of the larger projectile is 6 in. at the faces, and 7 in. at the angles, giving a mean of 6½ in., and that of the smaller 5¼ and 6¼ in., giving a mean of about 5½ in. The length of the 120-pounder shell, which at the trial of this projectile, in September last, was 17 in., with a bursting charge of 2½ lbs., was, on this occasion, 21 in.; Mr. Whitworth having been taught by experience the necessity of increasing the bursting charge, which now is 5 lbs. We do not give the particulars of the smaller shell, its effect not being conclusive, in consequence of the insufficiency of the bursting charge. The results obtained by the Whitworth projectile have to be considered in a twofold aspect—damage to the armour by penetration, destruction to the ship and crew by explosion. But here a new feature, which, if we mistake not, is an important discovery in gunnery, presents itself. The same projectile can be used as a solid shot or shell indiscriminately, and with equal effect in either form. The advantages of this double character, into the details of which it is unnecessary now to enter, must be apparent, and give a new interest to Mr. Whitworth's valuable invention. There is another point to which we draw especial attention, and that is the comparative penetrating force of the 6½ and 5½ in. projectile, because we shall have to adduce, from the results obtained, conclusions which may prove that the art of constructing invulnerable armour is much less speculative and uncertain than it hitherto has been. It remains for us to mention that the material of the Whitworth shot and shell, of which any serious damaging effect has to be recorded, is not cast-iron, but homogeneous iron or steel. It is, in fact, to this adaptation of material Mr. Whitworth is mainly indebted for his great success; for it is now established beyond a doubt that cast-iron shot will not do the work due, to its projectile force, upon the armour, as it expends a great part of that force in destroying itself. The steel shot is the steel punch. Who would think of using a cast-iron punch? The Whitworth shot are called flat-headed, and the first he made were literally so; but he has seen reason to modify the striking face by making about half its diameter in the centre convex, with a flat ring, slightly tapered, outside. This convexity, it is thought—and we believe with reason—facilitates generation.

Sir W. Armstrong has taken up the same idea in giving a round head to his new projectile, which, it is announced, will beat the flat heads, and we incline to think that will prove to be the case. His first rifled cylinders, employed for target experiments, had conical heads, terminating in a slight convexity about an inch in diameter. This form was designed to cleave the air with a minimum loss of velocity, and for light field guns and shell, intended to burst in the air at long ranges, it was efficient; but it woefully failed when applied to a battering projectile hurled against iron plates. The pointed nose broke off, and the main part of the cylinder fell innocuous at the foot of the target. In this matter, as in many others, the talented Director of Artillery has profited at the public expense.

The reader will now be able to follow our notice of the experiments with better means

of judging the results, and the causes to which these are due.

Before the experiments commenced, 5 pilot shots—3 from the 120-pounder and 2 from the 70-pounder—were fired at a wood target to obtain the range. This necessarily occupied some time, but it by no means implies a doubt of the accuracy of the guns, as the *Times* unfairly insinuates. It was the usual and proper precaution to insure precision in the experiments, and one always taken preparatory to trials of Armstrong guns, on which occasions it passed unnoticed, or at least called forth no sarcastic remark from the pen, which, through good or evil report, and in spite of disastrous failures, unflinchingly fought the battle of the official favourite.

The first trials were made with the 120-pounder, from which 5 shell and shot were discharged at the target. No. 1 (shell), weighing 150 lb., including its bursting charge of 5 lb., and fired with 25 lb. of powder, hit the centre (5 in.) plate with a velocity of 1,210 ft. per second, a few inches from the bottom, about an equal distance from both ends. It made a breach right through the plate into the teak backing, and exploded when partly imbedded in the wood, before it had passed through the plate. There can be no doubt on that point, because the screw-plug was forced 50 yards in front of the target in a diagonal direction, so much to the right, that the tail of the shell must have been outside the breach when the plug was blown off. A few broken pieces were picked up outside, and several larger ones were jammed inside the backing, which was torn into shreds resembling cocoa-nut fibre. The ¾ in. plate, representing the ship's skin, was burst open full 10 in. in every direction, and a frame was smashed in two places. Some pieces of shell and plate penetrated inside the deck chamber, but apparently not with much force, judging from the slight marks on the timber and iron lining. Three bolt-heads were started, protruding so far as to leave no doubt they were broken; three more were slightly started, and the points of two bolts, with their nuts, were sheeted off inside. The armour-plate was driven into the wood backing half an inch at the part struck, and buckled outwards at the ends more than one inch. To this effect, which is the invariable result of the yielding nature of wood, the rupture of the bolts is to be attributed. Similar effects, varying only in degree, were produced by the other shell and shot from the 120-pounder; in one case, seven bolts out of fifteen, which held the plate, were broken.

No. 2, another 150-pounder shell, with the same gun and bursting charges (25 lb. and 5 lb.), and 1,220 ft. velocity of impact, penetrated the top plate, which is 4½ in. thick, near to the bottom, and the explosion again took place in the wood backing, but the destructive effects were greater than those of No. 1, owing to the diminished resistance of half an inch less thickness of plate. The hole was larger and cleaner cut—the penetration into the backing, before explosion, deeper—the skin and one of the frames were more extensively smashed inwards, and splinters from the shell and plate were scattered with violence in all directions inside the chamber, many of them being driven into the wood lining. The teak backing was driven out at the top, and for some time emitted volumes of smoke, showing it was ignited. The plate was much dished, and seven bolts were broken.

No. 3, a cast-iron solid shot, weight 130, charge 27 lbs., which brought the velocity of impact up to 1,260 ft. per second, hit the centre plate near the top, close to a bolt-head, cracked the plate across the bolt-hole, but did not pierce through the plate, and broke up. There was a deep indent, the plate driven 3½ in. in at the top edge, and brought out ½ in. at one end; but there was no damage to the skin, and no penetration into the backing. These negative results, with an increased velocity, prove how much of the effect of the projectile punch depends upon the material of which it is made. Great part of the force of this shot was lost in destroying itself.

No. 4, a 130 lb. shell, with a gun charge of 27 lb., and a bursting charge of 3 lb. 12 oz., attained an impact velocity of 1,280, the highest in these experiments. The comparison of this shell with Nos. 1 and 2, which were fired with only 25 lb. of powder, is instructive. The problem to be solved was the effect of an increase of projectile force, by reducing the weight and increasing the velocity, in proportions, which give a better result in multiplying the square of the velocity by the weight, and the results justified the expectations of Mr. Whitworth. The effect of this shell is incorrectly reported in the *Times*, which says that "*it did no less than the former shells had done*, going through all and bursting inside, but it also did no more." Here is a glaring inconsistency, for the two first shells did not penetrate through the target, and this did; and the destructive effects of the latter inside the chamber were greater, although the bursting charge was less. This arises from the fact that the increased velocity sent the shell, if not right through all, much deeper into the backing, before it exploded. The missile struck the centre of a 5 in. plate, burst through it, making a hole clean cut outside to the thickness of an inch, but inside the remaining thickness of the plate was rent asunder, making a cavernous opening 12 to 15 in. in diameter; the fragments of iron were forced in by the shell, of which the base was found inside the chamber, with smaller splinters of shell, plate, skin, bolts, nuts, and rivets, and debris of wood, which, collected in a sack, was a good weight for a man to carry. No pieces of shell were found outside; the plate was cracked across a bolt hole; a gaping aperture, 12 by 10 in., was made in the skin, and the damage altogether exceeded that of any preceding shell or shot. The loss of life and limb to a new between decks would have been terrible.

No. 5, a 130-pounder solid shot of homogeneous iron, with a 25 lb. charge, and an impact velocity of 1,240, hit the middle plate a little below the centre. The objeet of this experiment was to determine the penetrating power of the Whitworth hexagonal, unaided by a bursting force in its interior. The success was complete; the destroying bolt sped its way unchecked through 5 in. plate, 18 in. of teak, ¾-iron skin, and an iron frame, crushing its path through all into what may be termed the chamber of death. The head and fore part of this terrible messenger, measuring 10 in. in length, was found in the chamber, having struck against what may be regarded as the other side of the ship, and left an indentation on the iron plate lining. The tail part, measuring 5 or 6 in., was torn away in the fierce struggle to force a passage. The head was set up at the moment of impact, its diameter being increased from 6½ to 8 in. The hole in the plate at its orifice was enlarged to 8½ in. in diameter, and torn open inwards, 12 to 15 in. The breach through the skin plate was a jagged gaping wound. Bolts were started and sheered off, but not in such great number, as before not many remaining to be destroyed.

This shot, as the climax of the effects of the 120-pounder, satisfied Mr. Whitworth, and brought the experiments with that gun to a close.

A series of trials, similar in arrangement to those first described, followed with the 70-pounder gun, but the results were far from being equally satisfactory to Mr. Whitworth. This gun did not do what the 120-pounder did. Not one shell or shot penetrated through the target, or even fractured the skin plate. We need not give the details of the four experiments which completed this series, but will briefly state the nature of each, continuing the numbers from the former series to prevent confusion.

No. 6, a 70-pounder live shell, gun charge 13 lb., bursting charge 2½ lb., impact velocity 1,160.

No. 7, 80-pounder live shell, gun charge 13 lb., bursting charge 3 lb. 12 oz., impact velocity 1,158.

No. 8, 70-pounder live shell, bursting charge 2½ lb., with increased gun charge, the velocity being augmented to 1,200.

No. 9, 70-pounder blind shell, without bursting charge, and, we believe, with 15 lb. gun charge.

Not one of these missiles produced the desired effect. No. 6 and 8, discharged against the 4½ in. plate, were the most effective, but the utmost extent of the work was to penetrate into the plate. They could not pass through it. The assault against the 5 in. plate was a greater failure. No. 7 having, by a desperate effort, with an increased charge, marked the circular crack of a core which was slightly driven in, but not through the plate, recoiled and fell to the ground a spent shot, in front of the target. No. 9 was the great effort. It was fired under the same conditions as the 130-pounder, No. 5, intended, with an increased charge, to penetrate without explosion, but its force was not equal to the task. The projectile doubled up and destroyed itself. Something was said about the quality of the iron, but we believe the truth is, that the 70-pounder has too much work to do against 5 in., and even 4½ in. plates. Mr. Whitworth, evidently chagrined at these disappointments, abandoned the further trials comprised in his programme, and these most interesting experiments were concluded.

It now remains to institute a comparison between the two series of experiments, from which important conclusions are to be drawn, but space compels us to be brief. The grand feature of distinction between them is, that the 120-pounder has penetrated a "Warrior's" armour and hull, and half an inch of iron to boot, with shot and shell, with the utmost facility. The 70-pounder completely and signally failed to drive either shell or shot through the armour plates, much less to damage the hull. The destroying effect of the latter on the fastenings is considerable; but this is to be attributed more to the through bolts and wood backing, which are proved sources of weakness, than to the force of the shot. To a certain extent, that is, as regards the wood backing, the same may be said with reference to the 130 and 150-pounders, whose penetrative powers met with little resistance after they had passed through the armour plates. It is in the direction of backing that we must look for the means of rendering ships' armour impenetrable.

This great duel is a trial of supremacy between two systems of ordnance, on which much remains to be said. Sir William is beaten in this contest, but he is not vanquished. In this eager conflict for victory in the attack, let us not lose sight of the defence, which may, notwithstanding the

contrary opinion of artillerists, prove to have the best of it. The close analogy between the penetration of iron plates by projectiles, and the ordinary punching process, to which we first drew attention, is attracting the notice of men of science and engineers. It is a significant fact that the Whitworth 6½in. flat heads pierced through and through 4½ and 5in. plates, those being less in thickness than the diameter of the projectile, but the 5½ in. projectile could not penetrate the 5 in. plate.

We leave the question there, for the present, and we must postpone our notice of the second day's experiment, to our next number.

THE FOREIGN LOCOMOTIVES IN THE INTERNATIONAL EXHIBITION.

(*Continued from page* 308.)

THE Paris and Orleans Railway Company sent a six-wheeled outside-cylinder, express passenger engine and tender, made at their works at Ivry. The eccentrics and links are outside the crank pin; the steam chests being also outside the smoke-box. Cylinders, 15¾ in. diameter, and 25½ in. stroke. The driving wheels are 6 ft. 7¾ in. in diameter; the leading and trailing wheels, 4 ft.; the total wheel base, 14 ft. 1 in. The leading axle-boxes have a lateral play of three-fourths of an inch. The fire-box heating surface is 96 square feet; the tube surface is 1,046 square feet. The tender contains 1,233 gallons of water, and about two tons of coal. This engine burns coal according to the plan of M. Tenbrinck. The general principle of this plan is the one running through most of the successful English and foreign coal-burning arrangements, namely, that of deflecting air into the firebox *above* the incandescent fuel in just sufficient quantity to mix with the products of combustion without cooling them down. The carburetted hydrogen gases issuing out of coal are always consumed without smoke if sufficient oxygen be given them without at the same time lowering their temperature to any great extent. Probably each of the different coal-burning plans has some special advantage, adapting it to the particular kind of coal it is intended to consume. Other things being equal, the simplest plan is of course the best.

M. Tenbrinck places the grate at a considerable slope downwards, causing the fuel to descend gradually as the combustion goes on. The grate is formed of two sets of firebars, the lower set being nearly horizontal. There is a common firedoor, but it is only used for cleaning the tubes. Below this ordinary firedoor are two openings extending the whole breadth of the fire-box. The top inlet, closed by a valve, is for the admission of the air, and the lower one is covered by a case into which the fuel is introduced by lifting up a door on hinges.

A water-table or flue is placed across the firebox above the sloping grate, and parallel to this latter. The flue deflects the air on to the fire below it, as the air issues from the upper opening. This diaphragm also replaces, to some extent, the heating surface lost by the great slope of the firebars. This system is said to be much liked in France, although, we should say, that it contains several objections.

We alluded, in our preceding number, to Mr. Belpaire's coal-burning arrangement, as being employed on the large French goods' engine then noticed. In this other plan, the grate is brought up on a level with the footplate, so that, if required, the trailing axle may be placed underneath the firebox. The grate is very long, and is made up out of five lengths of firebars. The firedoor is very large, and it is formed of two fire-brick plates, made with holes, which are regulated by slides, for the passage of the air on to the top of the burning fuel. The firebars are peculiar, being very narrow and close together, which must render them very difficult to keep clear of clinkers. We do not think that this plan of coal-burning would sufficiently consume the smoke of our English coals. Slack coal is said to be principally used in these engines. As is also usual in England, there is a steam-blower in the smoke-boxes of these coal-burning engines. It is mostly used when the engine is standing at the stations, as a substitute for the blast-pipe; and, it has a similar action, increasing the draught, and throwing down the smoky particles by means of the steam getting condensed within them.

Messrs. J. F. Cail and Co., and Messrs. Parent, Schaken, Caillet, and Co., jointly sent a 6-wheeled coupled, inside cylinder goods-engine, with 18-in. cylinders, 24-in. stroke, and 5-ft. wheels. The coupling rods look very light, being of steel. This engine has Mr. Caillet's peculiar arrangement for passing sharp curves. According to this plan, the leading and trailing wheels are capable of shifting transversely to the engine. Horizontal springs are arranged to bring back the leading and trailing axles to the central position.

The State Railway Company of Austria sent two locomotives, built in their large workshops in Vienna. These workshops—the most extensive in that country—have been for nearly 20 years under the management of Mr. John Haswell, one of our countrymen. One of these engines is an express locomotive, of a very original design, first proposed and carried out by Mr. Haswell. It is one of 12 engines lately built by this gentleman, exactly similar in every respect to the one exhibited, with the exception that the latter has, on each side, *two* double cylinders, each pair being cast together. It is an engine with outside framing, and the 3 axles are to the front of the fire-box. The wheel-base is only 11 ft. 5 in. The driving wheels are 6 ft. 9 in. in diameter, and are placed in front of the fire-box. The load on the driving wheels is about 12¾ tons. The weight of the engine when full is 32 tons. The area of the grate is 15 square feet. The total heating surface is 1,344 square feet, 1-16th of which belongs to the fire-box. The feed apparatus consists of 2 of Giffard's injectors. The 2 double cylinders are 11 in. inside diameter, and 25 in. stroke. Their axles intersect each other in the centre of the driving axle. Each axle is at an angle of 2½ degrees, with a horizontal line from the centre of the driving wheel. The connecting-rod of the top cylinder works a crank, keyed on to the driving axle, which is prolonged outside the frame. From the crank pin a strong steel bar is carried back on the same line as the above-mentioned crank, exactly opposite, and to the same distance from the centre of the axle. Another pin on this bar is worked from the connecting-rod of the lower cylinder. The pistons of each pair of engines are thus made to move in exactly opposite directions, and the reciprocating parts are thereby completely balanced at all speeds, a result impossible to be obtained by the usual arrangement of revolving balance weights. Rotating balance-weights, of course, cause a changeable load on the driving wheels, their influence varying as the square of the velocity.

Each pair of cylinders is worked by a single valve and link in a rather ingenious manner. There must, however, be a great waste of steam in the passages, as the valve face is evidently so far off. This engine has been completely successful in the main intentions of its peculiar design. At a speed of nearly 70 miles an hour, and with a load of 50 tons, it has run with perfect steadines. Last February it was tried in the shop, being hung up by the chain of a crane, so that the driving wheels were 2½ in. above the line of rails, and the leading wheels resting on these latter. At 400 revolutions per minute, the horizontal oscillation was only about 1-12th of an inch, the vertical oscillation being 1-5th of an inch.

This engine is called "the Duplex." We have heard some severe criticisms upon it, coupled with the proposal to re-christen it "the Complex." We cannot help confessing to an admiration of the way in which the complete balancing of the reciprocating parts has been carried out; it is to some extent a revival, in much improved shape, of an invention of that veteran schemer, Mr. L. R. Bodmer, of Switzerland, and formerly of Manchester. According to that gentleman's plan, the cylinder of an engine was to have two pistons, and two piston rods working one within another, with a connecting rod to each; the pistons alternately advanced to, and receded from each other in the cylinder. We believe that there are one or two large engines upon this plan still extant in the Lancashire districts. They require an occasional "doctoring up." One of the weak points of this latter arrangement consists, of course, in the tubular outside piston rod, which continually causes trouble, particularly from the necessarily weak attachment to its piston.

The other Austrian locomotive was also made at the works managed by Mr. Haswell; it has been proved capable of drawing about 200 tons load up an incline of 1 in 40, with curves of 300 feet radius, at a speed of about 10 miles an hour. It is a goods' tank engine, with ten wheels coupled; the cylinders are outside, 18 in. in diameter, and 25 in. stroke; the wheels are 3 ft. 3½ in. in diameter, being all coupled together in a peculiar manner. The boiler rests on two frames, coupled together by a pin, allowing them to swivel on passing round curves. The fore part, carrying the working gear and the front end of the boiler, has six wheels, with a wheel base of 7 ft. 4 in. The hind carriage, carrying the tender and the fire-box, has the four other wheels, also with a wheel base of 7 ft. 4 in. The total wheel base is 19 ft. 5 in. The heating surface of the fire-box is 78½ ft., the inside tube surface 1,244½ ft., giving a total of 1,323 square feet. The boiler is fed by two No. 9 injectors. The wheels are cast-iron discs, with steel tyres, and the balance-weights are cast on the wheels. The engine is fitted with a steam break. The engine, when in working trim, weighs about 46 tons, with a maximum load on a pair of wheels of about 12 tons 2 cwt. The remarkable peculiarity about this engine, as we mentioned before, consists in the arrangement whereby all the 10 wheels of the swivelling frame are coupled together, with the view of obtaining a greater amount of adhesion for ascending the steep inclines. We do not feel capable of making this arrangement fully plain without a sketch.

The engine from Prussia fully keeps up the name of the well-known shops of Borsig, of Berlin. This establishment has turned out more engines than any other works on the Continent. It is a 6-wheeled, 4 wheels coupled outside cylinder goods' engine. The cylinders are 17 in. in diameter, and 22 in. stroke. The driving and trailing wheels are 4 ft. 6 in.,

the leading wheels 3 ft. 4 in. in diameter. There are two slide valves to each cylinder, with a separate expansion link to each valve, so that there are in all four links. The engine, when full, weighs 32 tons, of which eight tons are on the leading wheels. The heating surface of the fire-box is 65 square feet, that inside the tubes 960 square feet. The maximum pressure of the steam is 100 lbs. per square inch. The tender carries 1,150 gallons of water, and two tons of coal. The cast steel rods, &c., look very light to an eye accustomed to wrought-iron proportions.

The Saxon engine, made by Hartmann of Chermutz, is a 6-wheeled, four wheels coupled engine. The outside cylinders are 15 in. in diameter, and 22 in. stroke. The leading wheels are 2 ft. 7½ in. in diameter, the driving and trailing wheels, 4 ft. 6 in. This engine when full weighs 28 tons. The fire-box heating surface is 70 ft.; the tube surface, 790 ft. The two leading wheels are arranged to form a "Bissell" truck. This is to meet the sharp curves (275 ft. radius) of the Saxon mountain railways.

The Belgian engine was sent by "La Société Anonyme des Hauts—Fourneaux, Usines et Charbonnages de Marcinelle et Couillet," Hainault. The fire-box is upon the slack coal-burning plan of M. Belpaire, a Belgian engineer. We have already alluded to this arrangement. It is a 6-wheeled coupled goods' engine. The inside cylinders are 17½ in. diameter, and 23½ in. stroke. The wheels are 4 ft. 9 in. in diameter; the wheel base is 13 ft. 1½ in. The heating surface of the fire-box is 86 square feet: the tube surface 1,141 square feet. The engine, when full, weighs 33 tons 9 cwt. The load on each pair of wheels was 11 tons 9 cwt. A little peculiarity of this engine that we have also noticed in some of the French engines, consists in the fashion of planing out the insides of the coupling rods, so that the cross section has the shape of a double-T. We suppose that this is done for the sake of lightness. The arrangement for reversing is rather neat. An ordinary reversing handle is worked by a screw, so that the link can be set to any position, without being tied to certain fixed positions, as in the links of the common reversing sector. The reversing handle can be disengaged from this screw if it be required to reverse the engine suddenly.

The engine from Naples demonstrates pretty clearly that reform is required in the locomotives, as well as in the political system of that country. It is a 6-wheel coupled goods' engine. The boiler barrel is not merely oval, to the extent of several inches, but also conical, being made larger at the fire-box end, and tapering towards the smoke-box. The coupling rods have merely brass brushes, with no arrangement to take up the wear. The man-hole is actually placed in the smoke-box tube plate. According to its bill of loading, we see the exhibitors put a value upon it of no less than 135,000f. The weight is given at 27 tons. They estimate it as an engine of 40-horse power! The reversing gear is balanced rather neatly by means of a large spring balance.

Several of the engines we have noticed have received medals and "honourable mentions." As these "awards" have evidently been given by some occult process, depending more upon the luck of the exhibitors than the wisdom of the jury, we have not alluded to them. We have an opinion of our own about these awards generally. We believe that the juries of the different classes wrote the names of the different exhibitors on little slips of paper, put them into a hat, shook them up in some instances, and drew forth the names of the "fortunate" receivers of the prize medals.

This review of a collection of locomotive engines, from almost all parts of the Continent, will show that we do not suffer by comparison in this department of mechanical science. In the matter of communication generally, which may briefly be said to be the same thing for a country as the circulation of the blood for an individual, we English have always shown a good example to the rest of the world. In the business of inland communication we first brought road-making into a system, and placed on our macadamised roads the finest horses of the universe. These not being found fleet enough and strong enough for our purposes, we have made iron roads and iron steeds. Having superseded the stage coach, we are now making traction engines to supersede the cart horse. IT.

IRON WALLS AND NAVAL GUNS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

WOOD BACKING.

SIR,—The last experiments at Shoeburyness have added new interest to wood backing. My reply to Mr. Cheverton affords the opportunity of expatiating on this subject to some better purpose than a controversy with a theorizing critic. I cannot let his personal remarks pass unnoticed, but I will be as brief as possible in dealing with them. In a strain hardly consistent with good taste in a scientific discussion, Mr. Cheverton begins with a sneer, and ends with slang. He terms opposition to wood backing a *crotchet*, and finding I am in search of something better, "he wishes I may get it." This is the absolute style of the scientific, as it is of the political republican. You must believe in his doctrine, or come under his lash. "Perdition to the colonies rather than abandon a principle," cried Mirabeau. "Nothing like leather," said the tanner. "Nothing like wood," says Mr. Cheverton. He clearly is a man of wood; let us see on what basis his predilections are founded. I do not wish to be hyper-critical; but, after carefully following his argument, I cannot see that it amounts to anything more than this assertion—"that, if "*enough of it* is employed, wood will keep out "cannon-shot," and he estimates 5 ft. in thickness as sufficient for that purpose in the case of a 68-pounder. I take it that, in accordance with his calculations, to stop the shot of 120 and 150-pounders, which undoubtedly will become service guns, 10 to 15 ft. in thickness of the ligneous material will be requisite. To say nothing of the difficulties of construction with such masses of timber, I should like to know the recipe of the author of this notable idea for preventing destruction by incendiary shells. He may reply, "I never made so absurd a proposition." *Cui bono*, then, to moot it. Why simply to obtain the petty triumph of proving that wood does offer SOME resistance. The meaning of my words, "little or no resistance," is obvious—namely, as backing to armour-plates for any practical or useful purpose. I totally dissent from the proposition that wood is "of great value as a backing for the sake of its resistance," and I regard this idea as so dangerous a fallacy that I oppose it, as I have done for more than twelve months, with all the energy of profound conviction. It is the prejudice of the wood school, as opposed to the men of iron, and has cost the country millions, wantonly wasted on a theory which, unfortunately, in the construction of our iron-cased navy, has been acted upon to an enormous extent without previous experiment. Call it a *crotchet*, if you please, but the total inefficiency of wood as a backing to iron armour—nay, its positively damaging character as a destructive agent—are *truths* so strongly impressed upon my mind, and established by conclusive experiments, that, in spite of the cavilling and railing of professional authority, as Galileo, in the midst of persecution, exclaimed, "The earth goes round," I shall insist upon the utter worthlessness of wood as a backing to armour plates.

"To aid the armour plate in repelling the blow" is "the first duty of backing." Let us see how wood performs that duty. At the moment of impact the first effect on the plate is an indent on the face and a bulge at the back, if the plate is not supported by a backing sufficiently rigid to resist or attenuate the force. This bulge is the beginning of the mischief; if it is not checked, the projectile force being sufficient, the bulge enlarges and bursts open and the projectile penetrates; but if the bulge at once encounters a rigid local resistance, the resisting medium, although it may be shattered, will tend to repel the projectile and cause it to recoil whole or in fragments. The utility of wood backing as an absorbent of the shock to the structure, as a whole, is undeniable; this comes from its yielding nature, but this very nature is the source of an evil of the greatest magnitude. The yielding of the backing causes the plate to be driven inwards bodily over an area of some feet around the point struck, and to buckle outwards at its extremities. The effect of this action, which a hundred experiments prove to be invariable, is disastrous: the fastenings, no matter what their nature may be, are violently rent asunder, and the plate thus separated from its holdings, would, with a rolling motion at sea, tumble off the side of the ship. Far better to have the armour riddled with shot holes, which might be plugged, than forty or fifty feet of surface left totally unprotected. The Duke of Somerset declared in the House of Lords that he had repeatedly, at experiments, seen plates fall bodily off the side of the ship; and I aver, as I have again and again before stated, that wood backing is the cause of this great calamity.

In the trials last week with the Whitworth shells this destructive action on the fastenings was clearly attributable to the wood backing. At whatever point a plate was struck it was more or less *dished*, that is, made slightly concave over an area of which the shot-hole was the centre, and buckled outwards at one or both extremeties. These results, which are entirely due to the yielding and elastic character of teak backing, told fearfully on the bolts, of which, to give an example, *7 out of 15 which held one plate were broken by a single shot*. If there were no other objection to wood as backing, this effect, which is invariable in a greater or less degree, alone condemns it.

Mr. Cheverton kindly informs me that to punch a hole in a plate, the latter is placed on a firm and solid bearing over the die, and he pities my ignorance or what he politely terms "want of practical knowledge in the manipulation of metals," because he supposes I am unacquainted with the common process of punching holes in boiler plates. But I refer to the very case I put with reference to punching as proving his mistake; and I must be so uncourteous as to retort that his illustration is not apposite, and his argument is a *non sequiter*. My proposition was, "If, in the ordinary punching process, a man wished to prevent the punch passing through the plate, would he as an obstruction, place under it

(that is, between the plate and the die) a wooden plank," and I reply, "certainly not," for the punch would go clean through the wood. But if a hard and unyielding substance were interposed the result would be different. Mr. Cheverton arrives at the conclusion, that because a plate being placed on a firm and solid support, surrounding the orifice of a die, is easily perforated by the punch, which forces out a core into the die, of which the edge aids the sheering, this proves that, to prevent penetration, it is better to place the plate on a soft than on a hard substance. But this conclusion is so palpable an inconsistency, I am sure it must have been inadvertently advanced. This gentleman appears to have read my letters. I wish he would refer to one, in which I describe experiments of the Iron Plate Committee on plates of the same thickness, one back, with three feet of solid oak, and one with a cast-iron block. A 40-pounder smashed the wooden-backed plate into fragments, but made no impression on the iron-backed plate, except a slight indentation less than half an inch deep. On principle this settles the question of rigid *versus* elastic backing, and there really ought to be no more said on the subject; but the men of wood, like the tanner with his leather, are so persistent in *their crotchet*, that I am obliged to reiterate mine, and despite their sarcasm and cavilling, I shall continue to do so, until wood backing is driven out of the field.

Mr. Cheverton makes me smile, in comparing the manipulation of *repoussé* or *embossed silver* to the effect of artillery on iron plates 4 or 5 in. thick. There is no analogy in the cases; the thin plate of precious metal has to be moulded with a delicate tool on a somewhat yielding material, and must not bear on a hard surface. He is not more happy in his reference to displacement. Surely he must know that, weight for weight and strength for strength, much greater displacement can be and is attained in naval architecture with iron plates than with timber. Why this is one of the main advantages of iron over wooden ships, and it is enhanced by the greater amount of stowage room within the frames or timbers.

Oddly, enough, my present antagonist taxes me with not regarding "limits or conditions," whereas I do make limits and conditions, based on the observation of *facts*, which are practical results, the foundation of my arguments. This, my communication to your journal, testify abundantly. If Mr. Cheverton, in his ardent devotion to wood, and his uncompromising advocacy of a theory, has not given himself the trouble to take any cognizance of the various and serious objections to wood backing stated in my letters, I cannot help it. But the fact is, he is guilty himself of the fault he wrongfully imputes to me. He takes no account of "limits and conditions," and convicts himself, as a pure theorist, by deliberately stating that "the question, logically and usefully at issue, is what given thicknesses are the comparative values of iron and wood in the matter of penetration."

Here, then, is the writer's sagacious view of the great naval armour question. Not the fitness of the material either for the construction of the ship or the armour, not the nature or structure of the material as calculated to resist the impact of iron shot and shell, or to avoid combustion, not even the *possibility* of rendering the materials, having regard to their expense as well as their weight, subservient to the required purposes, are to be taken into account; but we are only to consider whether a wall of iron 6 in. thick, or a wall of wood 6 ft. thick will offer the greatest resistance. Verily this is theorizing with a vengeance, and compels me to class the author of so bold a proposition with the enthusiasts of the Mirabeau school, who stand up for a principle at any price. Such a thesis as here advanced might pass muster, if it were of the same vague and slippery nature as "the wave or straight line" theory, which is almost as susceptible of a practical solution as perpetual motion, or squaring the circle. A number of letters on this question, which appeared in the *Mechanics' Magazine*, were read by me with attention until they made my head ache, in a vain attempt to understand the subject, and I gave up the attempt in despair. But the production of iron-cased ships of war is eminently practical, and step by step the best modes of construction, and the best methods, as well as the best material, for rendering the armour shot-proof, can only be determined by experiment. I know no other rule or method, and I must say that a man strongly prejudiced in favour of one material, and an absolute theorist, is not the man to lend a helping hand to the best solution of this question.

I have not taken the pains to refute Mr. Cheverton, and to prove his mistakes, in the hope of converting him, but because the reply to his letter offers the opportunity of thoroughly propounding my ideas on wood backing. I confess to a settled and profound conviction of the immense national importance of that one point as the very root of the question of the invulnerability of ships; and I say now, what I have said many times, that it was a fatal blunder to adopt the plan of fastening the iron cuirass of the "Warrior's," "Minotaur's," and, "Enterprise's" *on wood*—a blunder which it has cost the country millions to commit, and it will cost millions more to remedy.

Mr. Cheverton seems to think that, because he can imagine nothing better than wood, no other backing can be used but wood or iron, and he gives the preference to the former. But, in point of fact, several plans of backing, composed of other materials, and combinations of materials, are under consideration, and will soon be submitted to trial on experimental targets.

Happily the Admiralty is aroused to a sense of the danger into which the iron fleet of the future has drifted, and having shaken off the trammels of the men of wood, it has resolutely determined to enter upon a series of experiments on a liberal scale, with the view of ascertaining whether better modes of constructing naval armour cannot be discovered.

CIVILIAN.

OBSERVATIONS ON THE PROPOSED TELEGRAPH COMMUNICATION BETWEEN IRELAND AND NEWFOUNDLAND.

By Professor William King.

Having under examination the objects obtained from the Irish Atlantic Sea Bed by H.M.S. "Porcupine," of which a "preliminary notice" by myself appeared in the last number of the *Nautical Magazine*,* my attention has been, at the same time, directed to the nature of the Deep Sea Soundings on the West Coast of Ireland, with reference to the establishment of a telegraph connection between this country and Newfoundland.

Before proceeding further, I feel it necessary to state that, previously to entering on a consideration of the latter subject, I held no particular view in favour of any one place for the eastern terminus of the cable. Indeed, I confess to having entertained considerable doubt as to the practicability of successfully carrying a cable across the Atlantic at all.

I also wish it to be understood that I am not writing against any place whatever, for I feel convinced that it will be requisite ultimately to lay down two or more telegraph cables, and probably from different parts of the coast. It becomes my duty, however, on the present occasion, to show that Galway presents, in many points of view, claims which particularly recommend it for selection as one of the stations.

Looking at Mr. Hoskyn's valuable "Report on the Deep Sea Soundings to the Westward of Ireland," and the chart which accompanies it, in the *Nautical Magazine* of the present month, it will be seen that from the Isles of Arran, at the entrance of Galway Bay, there runs out, due west for the distance of 160 miles or more, a gently undulating sea bottom or terrace, having in no place an inclination surpassing that of an ordinary beach. Throughout the entire extent of this terrace the depth of water averages about 100 fathoms, and rarely exceeds 200 fathoms. Near its western termination the terrace is more elevated than elsewhere, except its shore end, giving rise to a flatly-rounded bank, which, in its highest or shallowest part, is little more than 80 fathoms below the surface of the ocean. This elevation, which Mr. Hoskyn has named the Porcupine Bank, appears to extend from the parallel of Cushla Bay, on the south, to that of Innis Boffin, off Connemara, on the north.

At the westernmost edge of the terrace, about fifteen or twenty miles from the shallowest part of the Porcupine Bank, there is, compared with the inclination above mentioned, a rapid descent into deep water, which, however, is not so in reality, being only about 700 fathoms in ten miles. The greatest depth attained in the part alluded to is 1,500 fathoms.

Guided by the maps appended to "Maury's Physical Geography of the Sea" (p. 11) and to Wallich's "North Atlantic Sea Bed," there are grounds for believing that on the parallel of Galway, the last mentioned soundings has gradually continued down to what is termed the "telegraph plateau," a vast submarine plain stretching thence all the way to the banks of Newfoundland, with a pretty uniform depth of about 1,760 fathoms, or two miles.

If the telegraph cable were laid down on the route I have sketched, commencing east of Cushla Bay, which is about 10 miles due west of the town of Galway, and traversing the terrace just described, there is good reason to believe that it would rest on a bottom singularly free from impediments. For the first 160 miles, the bottom consists of calcareous mud and the finest sand, charged for the most part with Polythalamous Foraminifera. In the shallow portion of the terrace forming the Porcupine Bank, the bottom consists of fine and coarsish gravel, with an abundance of shells of various kinds. On the slope which descends to the telegraph plateau, the bottom consists essentially of Monothalamous Foraminifera; and I have no doubt that the same minute organisms and their debris occur spread over the entire plateau, forming a deposit so soft and oozy, that a cable would readily sink into it.

With regard to the bottom, near the landing places, I can only speak of that on the Galway coast. Between the north Isle of Arran and the

* This preliminary notice referred principally to microscopic organisms in the deep sea bed. The writer says:—"The marvellous profusion of *Foraminifera* and other minute structures occurring on the Atlantic sea-bed wherever it descends below the level of a few hundred fathoms, shows that, over a vast portion of the submarine area between Ireland and the United States, there are being formed calcareous deposits analogous to common limestones. While nearly all the particles of these deposits are either the testaceous coverings of dead *Foraminifera* or the impalpable debris of their shells, it is evident that the surface of the Atlantic sea-bed is one vast sheet of the same organisms in a living state, whose office it is to clear the waters of the ocean of all the mineral and organic impurities which are ever flowing into them......Although perforating mollusks are living at great depths, I do not think that there are any grounds for apprehending that they would bore into a telegraph cable. I am also inclined to believe that there is little chance of a cable getting injured if laid down on foraminiferous bottoms; as in such places vital and chemical actions appear to be going on so unceasingly and copiously, that a cable thus circumstanced could not but become covered up in the course of a few years with considerable foraminiferous accumulations."

Skirds there is "foul ground" lying immediately off the proposed landing place. The rocks, judging from those on the adjacent land, are evidently rounded hummocks of syenite and granite, with surfaces worn down by the action of geologically ancient field ice and other glacial agents, such as now prevail in Greenland and in Alpine regions. Instead of being dangerous to a cable, provided it had the ordinary protective coverings, these submarine rocks would probably prove advantageous, inasmuch as they would prevent trawling and line fishing, as well as the anchoring of ships where they prevail.

It is quite possible in laying down the cable to avoid the Porcupine Bank, which, as I have already stated, does not extend south of the parallel of Cushla Bay; but if it should be carried over this bank, no fears need be entertained of the effects of the heavy seas which characterise an Atlantic storm, because, as shown in my "Preliminary Notice," the smallest stones occurring on its suface exhibit appearances of being as little disturbed as if they were at the bottom of a lake. On the other hand, a buoy might be permanently placed on the bank, in proximity to the cable, to indicate where the latter could be found in case of accident; by this means, the repairing of injuries (which I cannot but conceive would be of very rare occurrence) sustained on this side of the Atlantic would be materially expedited.

I may, in passing, remark that the Porcupine Bank is an important feature in favour of making Galway an Atlantic Packet Station. In being the most westerly land-fall on the coast of Ireland, it will enable steamers, during a fog or cloudy weather, to obtain, by soundings, an early intimation of their approach to land, while, both on the north and on the south, no such advantage exists, because the outer edge of the hundred fathoms' terrace, of which the bank is an outlier, treads rapidly towards the land approaching it to within only a distance of from 25 to 50 miles.

If now we refer to the Atlantic sea-bed off the coast of Kerry, it will be found to present features of a different character. Beginning at the coast—say, near Valentia—the bottom slopes down somewhat suddenly to the depth of 525 fathoms; it next rises again, apparently at the same angle, till it reaches a level varying from 195 to 230 fathoms below the surface of the ocean, and where it forms a submarine ridge about 25 miles in width, 140 miles from land, and terminating southward on the parallel of Cape Clear. This ridge, which is evidently a tongue or southern extension of the deepest portion of the terrace lying off Galway, declines rapidly—that is, on its western side—to a depth of from 1,500 to 1,700 fathoms. Further out, the bottom sinks to 2,040 fathoms. Now, if we refer to Maury's map, it will be seen that the last-mentioned soundings, by proceeding to the south, makes that part of the sea-bed where it was obtained a portion of the great 3 miles' deep submarine valley, which was down to the Cape Verd Islands on the coast of Africa, and which, according to the authority cited, actually attains nearly its maximum depth—viz., 2,675 fathoms—somewhere off the south-east coast of Kerry.

Unfortunately, the soundings north of the parallel of Valentia, and near the meridian we are now in, are not sufficiently known, but from the rise of the bottom, as indicated by the two last mentioned soundings, it is to be suspected that the three miles' deep valley gradually rises up to the two-mile deep telegraph plateau, somewhere on the parallel of Loop Head, in Clare. It may possibly extend much farther north, but even in this case it cannot but have lost its distinctive character, and become reduced to a mere trough on the telegraph plateau.

It will now be seen that a telegraph cable, running from any part of Kerry, must, of necessity cross two valleys, the easternmost one upwards of half a mile in depth, and the westernmost, about three miles, before it reaches the Telegraph Plateau. Nothing is known of the western side of the deepest valley, but its eastern side appears to be rocky. The specimen of *Discina*, a shell which lives fixed to stones, rocks, and other objects, mentioned in my "preliminary notice" as having been taken on the east side of the valley, of the depth of 1,240 fathoms, may be regarded as supporting this apprehention.

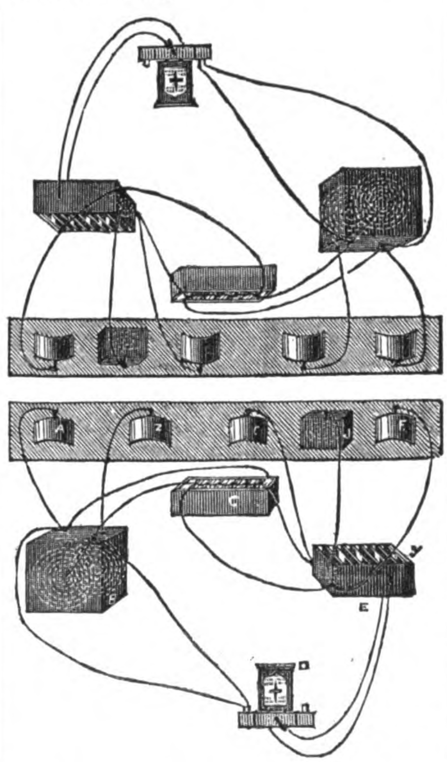
The difficulties attending this route, however, may very possibly be overcome by carefully selecting the course where unfavourable circumstances least prevail, and allowing sufficient length of cable to be payed out, so as it may rest on even portions, not only elevations, but depressions, of the irregularities of the sea-bed.

In conclusion, I may remark that it appears to me, that the conditions most favourable for a telegraph cable between this country and Newfoundland, are a gentle, undulating in-shore bottom, extending far into the Atlantic before attaining any great depth, and its outer edge passing down to the deep telegraph plateau by a not over rapid fall. These conditions can be found nowhere on the coasts of Ireland, except off Galway, where also occurs the Porcupine Bank, the advantages of which have already been stated.

Belmont, near Galway.
November 15th, 1862.

TELEGRAPH APPARATUS FOR SENDING MESSAGES WITHOUT THE USE OF WIRES.

The accompanying engraving represents an arrangement of plates and apparatus for transmitting electric signals and telegraphic messages to distant places without the use of conducting wires or other artificial medium, the invention of Mr. J. Haworth, of Southampton-street, Bloomsbury.



Two plates of metal, one of copper and one of zinc, are buried in the earth. Each separate and distant about one foot from each other, and retained in an upright position and slightly bent so as to form the segment of a cylinder, the axis of which is perpendicular to the surface of the earth. They are buried in such a position as to present their convex sides towards the place to which it is intended to send signals. For a distance of twelve miles and up to seventy-five miles plates of one square foot have been found sufficient. For a distance beyond that up to two hundred miles larger plates are made use of. Two other plates, one of copper G and one of zinc F, in position as shown, each of similar size to plates A and Z and also similarly curved in an upright position, and about two feet distant from each other, with their convex faces also towards the place to which it is intended to send signals. Between these two plates G and F, but not in contact with either plate, is a wooden box marked J, covered with zinc or other material, to preserve it from damp, containing a coil of coated copper wire insulated from the box by shellac or sealing wax poured in a melted state around it. The length and size of the coil found effective has been twelve miles of No. 15 wire.

The plates A and Z are connected, by means of copper wires, to each end of the primary coil fixed in an apparatus B, containing two coils, a primary and a secondary coil, of insulated copper wire, insulated from each other. The length of the primary coil employed is twelve miles of wire No. 15 for experiments, varying from twelve miles up to seventy-five miles; for a distance from seventy-five miles up to two hundred, seventeen miles of primary coil are found sufficient. The coils are about sixteen inches diameter and the primary one about three inches and a half thick, the secondary about one inch and a half.

The internal end of the primary coil is connected by means of a wire to the extreme copper or silver plate of an ordinary galvanic battery C, and the internal end of the secondary coil to the opposite or zinc end of the same battery. The size and power of the battery will depend in some degree upon circumstances, such as the distance to which it is intended to convey the message, the strength and direction of the earth's currents, and even the state of the weather, more power being required in dry than in damp weather. These points must be taken into consideration and allowance made for them.

Similar wires are connected to the same ends of the primary and secondary coils in box B, which are connected with the battery to the binding screws of an ordinary telegraphic indicator D, so as to be capable of being brought into connection with its coil by the motion of the handle.

The ends of the coil surrounding the magnetic needle of D are brought into permanent metallic connection by binding screws, with the condenser or safety valve apparatus E. The condenser consists of glass plates inclosed in a box, with grooves for the plates to slide into. The glass plates are covered with pure gold leaf extending down them about half the way, namely, from the top to the centre, but are insulated from the box by shellac. At one end are two coils, primary and secondary, of insulated gold wire, each coil resembling in shape the form of a watch spring and each insulated from the other by shellac. A ribbon of pure gold is passed alternately over and under the partially covered glass plates so as to be between them all. The extremity of the ribbon is attached to the centre of the secondary coil of gold wire. The outer end of the secondary gold coil is connected with the centre or inner end of the primary coil.

The plates F and G are connected by means of copper wire with the zinc pole of the battery C.

At the point to which it is intended to transmit the message a zinc plate H, and a copper plate Y, similarly curved and similar in size and position, and for similar uses as plates A and Z, already described. The plates H and Y should be buried in the earth with their convex sides towards plates G and F.

Corresponding apparatus are fitted at a distant station: the upper part of the engraving is supposed to represent it, having the plates and batteries buried in the earth in a reverse manner.

On the authority of Mr. James Bruce, marble may be bent or moulded to any required shape by means of a sand-heat, when long continued.

THE MANUFACTURE OF IRON.

At a recent meeting of the Manchester Philosophical Society, Mr. Dyer, Vice-President, exhibited a broken screw bolt, 1¼ in. square (used to fasten a cart body to the axle). The fracture, near the head end, appeared very much like one of cast iron; imbedded in the centre of the bar was a smooth egg-shaped mass about ½ in. diameter, crossing the fracture, and leaving a cavity as its mould in the metal on one side. He assumed that faults like this were pro ably owing to the rapid processes in use for re ucing masses from the puddle into bars of wrought iron, whilst the metal was only partially converted to the malleable state, as appeared in this sample of bad iron. The iron, in a semi-fluid state is passed from the furnace through a succession of rollers, without re-heating or faggoting, as were formerly practised, and at once reduced to the sizes required. The improved rolling mills could not, it seemed, insure improved qualities of wrought iron, whilst they afforded temptations to make it far inferior to any that could have been made fifty years ago. Considering the many hazards to which life and property are exposed in travelling by railway and otherwise, from the iron "shuffled off in haste," and found in use in engineering constructions, it becomes important that previous tests should be employed to ascertain the real nature of the iron, so as to leave no question of its being in a safe condition for the purpose intended, and not like this specimen, and like much now-a-days made by pressing the half-converted puddle into marketable shapes.

In connection wtih the subject of the slow changes which iron undergoes, M. Breguet, of Paris, stated that in their furnace for preparing soft iron he had observed a remarkable case of crystallisation of wrought iron. One of the furnace bars became brittle, and, on breaking a portion of it, he found it to contain a large cubical crystal of iron, each of whose sides measured five millimetres in length. This singular specimen is now in the possesion of M. Balard.

TO CORRESPONDENTS.

Received.—R. W. W., W. A., J. P. D., J. N., B. and Son, J. H., Miss T., F. J., W. B., J. P., Capt. C , G. H. G., G. B., G. S. (2 parcels), A. C. and Co., J. B., E. W. W., G. H., W. T., J. B. R., Dr. R.

Correspondence.

[*We do not hold ourselves responsible for the opinions of our Correspondents.*]

EXPLOSIVE POWDERS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Sir,—Mr. John Horsley, Esq., F.C.S., analyst for the county of Gloucester, discovered, some years since, that if chlorate of potassa and nut gall, each reduced to a very fine powder, be well compounded, in proportion of three to one, by weight, the product will be violently explosive.

Some experiments recently made, apon a small scale, appeared to show that the best sporting gunpowder gave an impetus of 4, while a like charge of Horsley's powder gave an impetus of 9; so the respective initial velocities were as 4 to 6, and, consequently, the respective percussive force of each was as 16 to 36, or as 1 to 2¼; that is to say, the powder composed of chlorate of potassa and nut gall is 2¼ more violent than the best gunpowder, in small charges; perhaps more so in larger charges.

It should be stated that Horsley's powder explodes at about 450 deg. temperature; and that it can be explodea by *excessive* friction, or by the action of sulphuric acid. It is admirably adapted to the charging of submarine shells, and it may possibly be the thing Mr. Whitworh requires for his projectile shells.

Horsley's powder can be manipulated with much greater ease and safety than common gunpowder, and can be stored as common gunpowder. And, moreover, if the two ingredients be stored together, *unmixed*, no explosion would ensue if the magazine were fired.

John Harvey,
Capt. R.N.

5, Keynsham-parade, Cheltenham,
November 14, 1862.

LITERARY PIRACY.

Sir,—The attemps I made, some years ago, to bring the subject of elementary geometry into a more sound and healthy state, both here and in schools, were very ably promoted by the notices which appeared in Nos. 1,175, 1,227, and 1,269, of the Mechanics' Magazine.

In the review of the School Edition, in 1,227, you took occasion to censure the piracy of my book by the then Reverend (but now Right Reverend Bishop) Colenso; and the exposure of his plagiarism had so far effect, that Mr. Colenso did not succeed in his object. It has been a further satisfaction to know that the favourable opinions expressed of my editions of Euclid have lately been followed by the award of a medal by the Jurors of Class 29 of the last International Exhibition, 1862. The Exhibition had scarcely closed, when a plagiarism of my books was published by Messrs. Macmillan at 3s. 6d., entitled a "College and School Euclid, edited by J. Todhunter, M.A., Fellow of St. John's College." I do not hesitate to say, that this is a more manifest wrong doing than that of Mr. Colenso. The latter took only the geometrical exercises, but Mr. Todhunter has besides taken up my manner of arranging the demonstrations, with this difference only, that he begins each step in a vertical line down the margin of the page, and has liberally used my notes. He has printed his book in the same type and style as my university edition. Any one, on comparing the books, could not fail of seeing where Mr. Todhunter has taken the greater part of the materials for making up his book; and of course what he has taken in this way could be purchased at 3s. 6d., a less price than 4s. 6d., the published price of my school edition.

This is not Mr. Todhunter's first attempt at work of this kind: not long since he took largely from Mr. Lund's edition of "Wood's Algebra," for a book on algebra he published. Mr. Lund put forth a pamphlet and remonstrated, pointing out how far Mr. Todhunter had invaded his work. The injustice to Mr. Lund was acknowledged here; but his book was and still is recommended by the College tutors—(I enclose one instance.) But what is more marvellous, the Master and Seniors of his College expressed no censure of his doings, or took any steps to vindicate the right of Mr. Lund, a former Fellow of St. John's College. Perhaps they see no harm in such proceedings, as they have long been practised by Fellows of St. John's College, as you pointed out in page 157 of the No. 1,227 of the Mechanics' Magazine.

I have ventured to bring under your notice this second attempt, under the impression that the general principles of literary honesty are vindicated in your pages, independent of any personal considerations. A foot note in page 41 of No. 1,300 of your Magazine has led me to this opinion, and I feel persuaded that at your hands even-handed justice will be awarded, if you should have time, and feel disposed to institute a comparison of the work of Mr. Todhunter and my own.

I trust I may be pardoned for the liberty I have taken of bringing the subject under your attention, and I remain, Sir,

Yours, &c.,
R. Potts.

Trinity College, Cambridge,
17th Nov., 1862.

PORTABLE SHIPS' PUMPS.

Sir,—In the account of the trial of Portable Ships' Pumps, page 317 of last week's number (copied from the *Times*), there is a slight inaccuracy which I shall be much obliged if you will allow me to rectify.

The report says—"Mr. Stone's pump was of similar dimensions (to mine); but pronounced superior in power and capacity in each of the tests, as to distance, height, &c... The third engine was that of Mr. Gossage, of the Admiralty, and manufactured by Mr. Stone, which underwent the same series of trials as the two named above, with a slight advantage over that of Mr. Roberts."

I beg to observe that my pump was made in October, 1860, expressly to compete with the pump known as Mr. Gorsages; for this purpose I made it as near the same capacity as possible, mine being 326 inches, and Gorsage's 332 inches; the weight of my pump is 2 cwt. 1 qr. 20 lb., and Gorsage's 3 cwt. 2 qr. 7 lb., rather a considerable difference in a machine to be carried about, used in boats, &c.

For some reasons, these trials have been postponed from 1860 until 1862, my pump being ready all the time.

On the 6th inst. my pump was first tried, and delivered 108 gallons with 89½ strokes, being 3½ gallons *more* than due to its capacity. Gossage's, with the same number of men, delivered 107 gallons with 102 strokes, or 14¼ gallons *less* than due to it. In the next trial, with 8 men, my pump delivered 108 gallons with 87½ strokes, being 5¼ gallons *more* than due to it, and Gossage's, with 123 strokes, delivered 110 gallons, or 36¼ *less* than due to it; and with a ⅝ nose pipe my pump delivered 112 gallons with 100 strokes, being 5 gallons less than due to its capacity; and Gossage's, with 158 strokes, delivered 104 gallons only, or 84 *less* than due to its capacity.

In distance, we both threw 67 ft. with ⅝ nose pipe; with ½ do. Gossage could not get any further, but mine threw 75½ ft.; in height there was a still greater difference, my pump throwing the water from 15 to 20 ft. higher in both cases. I think, sir, this proves the *slight advantage* was in my favour.

Mr. Stones pump weighed 3 cwt. 0 qr. 1 lb., and its capacity is 404 in. (about 24 per cent. larger than mine). In the first trial it delivered 110 gallons with 78 strokes, being 3¾ *less* than its due; in the second 109 gallons with 81 strokes, being 9¼ *less*, and with the ⅝ nose pipe it delivered 114 gallons with 85 strokes, being 10 less than due to its capacity; in distance it threw rather further than mine, but did not reach my height. I almost venture to think, sir, in this case also the slight advantage is on my side.

I am, &c.,
Wm. Roberts.

Millwall, Poplar, E.
Nov. 18, 1862.

CORROSION IN BOILER PLATES.

Sir,—Will you allow me to suggest a very simple method of superheating steam, and preventing corrosion in the plates of marine boilers—viz., "by coating the interior surface of the places with two several coats of black oxide of manganese and lamp-black."

Acids have no effect on this composition, while the *manganese decomposes* the muriatic acid of the sea-water, converting it into *chlorine*.

I am, &c.,
James Bruce.

London, Nov. 19.

Meetings for the Week.

Monday.—Royal Geographical Society.—"Latest Explorations in Africa," by Dr. Livingstone, and his brother, Mr. Charles Livingstone, Captains Speke and Grant, Consul Petherick, Captain Baker, R. Moffat, Captain Burton, &c., at 8.30 p.m.

Tuesday.—Institution Civil Engineers.—"The Hownes Gill Viaduct, on the Stockton and Darlington Railway," by Mr. Wm. Cudworth, M.I.C.E., at 8 p.m.

Wednesday.—Society of Arts, at 8 p.m.

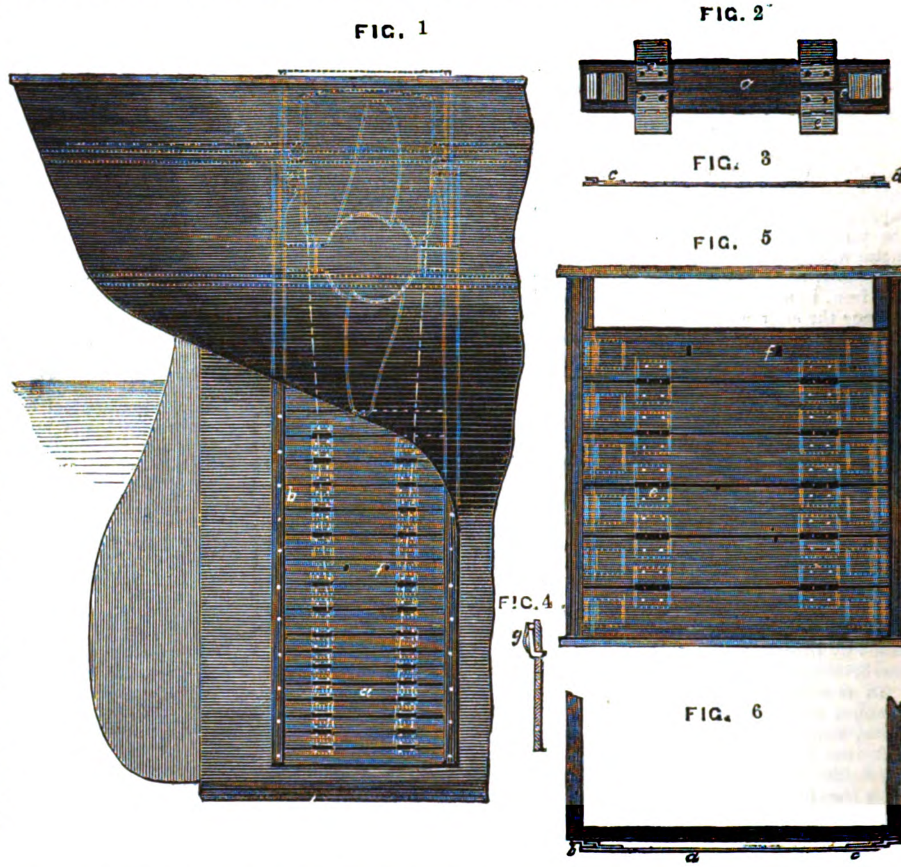
Thursday.—Civil and Mechanical Engineers' Society.—On Coal Gas, by C. Chubb, Esq., at 7.30 p.m.

Bread-making Machines.—On the 2nd of September last, we inserted an extract from a letter by Mr. Edwin Clayton, of Nottingham, giving an account of a bread-making machine, patented by him in 1830. Influenced by his letter, we felt doubtful of the validity of Mr. Steven's patented bread-making machine. On enquiring into the matter, we found that Mr. Clayton's machine consisted of a revolving kneading-trough, with arms to work the dough, which arms have a reverse motion; and that Mr. Steven's patent consists of a fixed trough with revolving knives.

Aluminium Gold.—Most of our readers have heard of aluminium bronze which is a compound of aluminium and copper. This material is likely to be applied in various ways. Messrs. Reid and Co., Newcastle-on-Tyne, have patented its application to watches. It is of golden colour, hard, takes a high polish, and is less liable to scratch than silver or gold.

Means to Prevent the Rotting of Woods.—In order to prevent wooden posts and piles from rotting while in the ground, the following receipt has been sent to the Societé d'Encouragement, Paris. A certain paint is used which has the hardness of stone, which resists damp, and is very cheap. It has been in use for the last five years—50 parts of resin, 40 parts of finely-powdered chalk, about 300 parts of fine hard sand, 4 parts of linseed oil, 1 part of red oxide of lead, and 1 part of sulphuric acid, are mixed together. The resin, chalk, sand, and linseed oil are heated together in an iron boiler; the red lead and the sulphuric acid are then added. They are carefully mixed, and the composition is applied while hot. If it be not found sufficiently fluid, it may be made thinner by adding some more linseed oil. This paint, when cold and dry, forms a varnish of the hardness of stone.

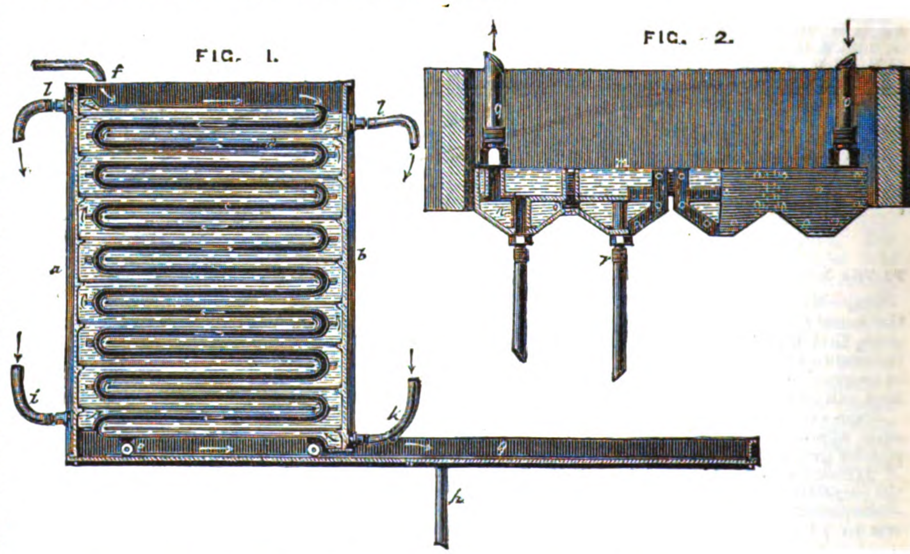
MAJOR-GENERAL HUTCHINSON'S IMPROVEMENT IN SCREW PROPELLER SHIPS.



It is well known that screw steamers lose a great portion of their efficiency as sailing vessels, from the free passage of water through the screw aperture when the screw is raised—especially is that loss apparent when "on a wind," but at all times it increases the difficulty of steering screw ships when under sail, more particularly ships of great length.

The engravings illustrate an arrangement just patented by Major-General Hutchinson, of Plymouth; it consists in filling up the well or space left between the frame or body post and stern-post in ships propelled by a screw, when the screw is raised, by causing plates of metal to slide down in a suitable frame in succession from the deck until the aperture is filled. Fig 1 is a side elevation of the stern of a ship, with the plates *a a* in position, and the screw raised. Each plate *a a* has on its inner sides, lips, or angle pieces, *c c*, as shown at Figs. 2 and 3; these angle pieces form recesses in which guide bars or frame *b b* act. The plates may be hinged together to enable them to be lifted by means of suitable tackle, when desired. The lower plates are shown narrower than the upper ones, to allow of them passing the curvature of the guide bars *b b* at the screw shaft portion of the stern. If it should be found desirable, all the plates may be detached and slid down separately, holes *f f* being provided in each plate to enable its being raised by the hooked catch *g* shown at Fig. 4. Figs. 5 and 6 show a part of the after cabin framing, in which a portion of the plates are stowed when not in use. Both sides of the stern are fitted in the same manner. The column of water between them greatly adds to the stability of both sets, as the water cannot be instantly displaced, and no beams can be pressed inwards by the force of the sea without the corresponding plates on the other side being pressed outwards.

TIZARD'S HEATING AND COOLING APPARATUSES.



The engravings illustrate two apparatuses for heating, cooling, and condensing, the invention of Mr. W. L. Tizard, of Mark-lane. Fig. 1 is a sectional view of an oblong box, containing a number of cellular plates *c c*, piled one above the other, and held together by means of bolts passing through their flanges. To the inside of the casing *a*, a series of partitions are secured; these are so placed as to occupy the spaces in the cellular plates. Another set of partition-plates on a door *b* occupies the spaces in the flanged cellular plates *d d*. The flanges of these plates *d d* are set in a reverse direction to flanges of the plates *c c*. The door is mounted upon small wheels *e e*, to enable its being moved along the rail in the tray *g*, as shown for the purposes of cleaning and repairs. The wort or other material to be heated or cooled is fed by means of the pipe *f* on to the upper cellular-plate from which it passes in a zigzag form, as indicated by the arrows, and falls into the tray *g*, thence by the pipe *h* to any suitable receiver. The water is supplied to the apparatus by the pipes *i*, *k*, and passes out by the pipes *l l*, as indicated.

Fig. 2 shows another arrangement for cooling brewers' worts when they are undergoing vinous fermentation, and also for collecting the yeast. The engraving shows a number of shallow troughs, *m m* having inverted cone-like bottoms *n n*, in communication one with the other by short pipes *o o*; these are supplied with water by the pipe *p*, which issues by the pipe *q*. The troughs *m m* contain the yeast or other liquid to be cooled, and the beer contained in it runs off by the pipes *r r*. The wort troughs may be put in communication with one another by pipes, if desired.

The farmers about Savannah, N.Y., are using six-cent papers of turnip seed as a circulating medium, in the absence of silver. They pass readily among agriculturists. A dollar or two in the medium would be nice in the pocket.

According to some of the Swiss journals, the passage of the Alps by railway on a second point—the Simplon—is in contemplation. A committee of delegates of the Swiss Cantonal Governments have held a conference at Lausanne, where a resolution was come to that a special committee should be named by the Governments of Geneva, Vaud, Friburg, and Valais, in order to come to an understanding with the company having the concession of the Italian line, and to concert on the ways and means for carrying out the plan. The intention is to bore a tunnel, the total length of which is to be from 4,600 to 4,700 metres. The rock to be cut through is easy to be perforated, and is so uniform and solid, the supposition is that it will not require to be faced with any masonry.

A company has just been formed in Greece for cutting through the Isthmus of Corinth, and thus avoiding the long and dangerous coasting of the Peloponnesus. From the earliest times the immense advantage of a canal joining the two seas has been admitted. Nero commenced the work, and traces of it still exist. This latter plan is the one to be now resumed. The width of the canal would be 112 ft., and its depth about 20. Its length would not exceed 3¾ miles. The advantages to navigation to be derived from the cutting of the isthmus are easy to be perceived. For vessels on their way from Marseilles and the Mediterranean to the Piræus the distance would be shortened by 90 miles. The saving of time to vessels coming from the Adriatic would be still more considerable.

SILVER'S SPEED GOVERNORS FOR ENGINES.

FIG. 1.

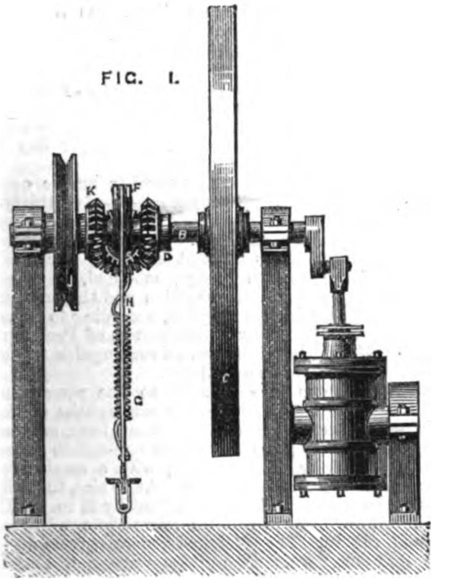


FIG. 2.

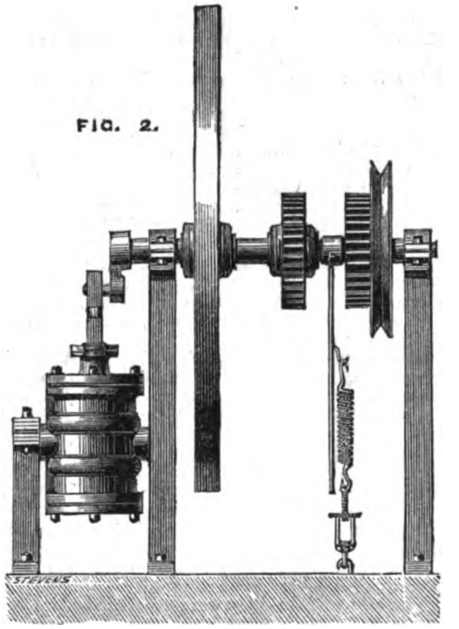
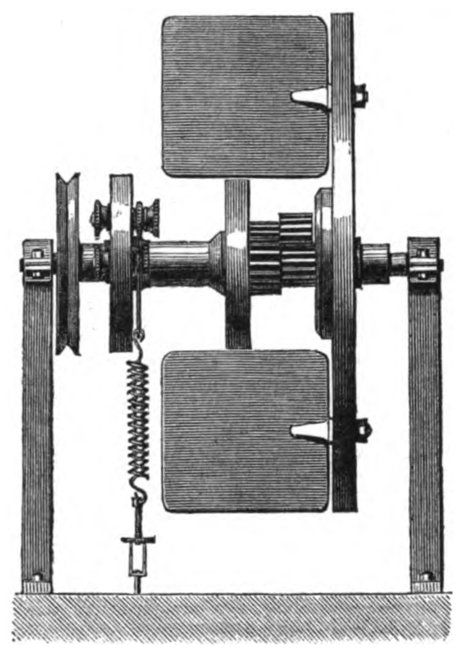


FIG. 3.



THE above engravings represent three arrangements of governors for regulating the speed of engines, the invention of Mr. T. Silver, of Bury-street, London. Figure 1 is an elevation of a governor, in which an independent engine is made to rotate the horizontal shaft B, upon which the fly wheel C is keyed fast. There is a mitre pinion D keyed to the shaft, and an intermediate pinion E turning loosely on the vibrating arm F. The arm F has an eye or boss, in which, or through which, the shaft B rotates. The one end of the vibrating arm F is shown as connected to a spiral reacting spring G, whilst the opposite end is connected to the throttle valve lever H. The spring G in this case forms no material part of the regulating apparatus, but is employed as a safety spring, being intended for closing the throttle valve in case of any part of the machinery breaking down. The pulley J, or means of receiving the rotatory motion of the main engine, has connected to one face a pinion K gearing with the intermediate pinion E. The pulley J and the pinion K run loosely upon the horizontal shaft B. Thus, upon a difference arising between the speed of rotation of the independent engine and the main engine, the intermediate mitre pinion is made to move around the shaft, and thus act upon the throttle valve.

Fig. 2 exhibits a modification of Fig. 1, by the substitution of spur wheels and pinions instead of bevel wheels, employed for the purpose of taking advantage of the difference of speed between the independent engine and the main engine. The vibrating arm F has two eyes or bosses, one in the centre and the other at one end thereof; the eye at the outer end of the vibrating lever carries a short shaft, one end of which is keyed a spur wheel, and the other a spur pinion. The pulley has a spur pinion upon one face, and they are free to revolve together upon the main shaft or axis.

Fig. 3 exhibits another modification, in which the position of the spur gearing upon the main shaft or spindle is changed, and the fly wheel, which is shown as being fitted with vanes, is not keyed fast upon the shaft, but is free to turn thereon to a limited extent, motion being communicated to the apparatus from the main engine by means of a pulley, wheel, or other gearing; the pinion receiving the motion is keyed upon the main shaft, the retardation offered to the rotation of the fly wheel beyond the velocity to which it is regulated creates a difference between the revolutions of the two parts of the apparatus. Upon such difference arising, the two spur pinions, which are mounted upon a stud projecting from the face of a disc (which is here substituted for the vibrating arm shown in the previous illustrations), is made to travel partially around the spur pinion keyed fast to the main shaft close to the boss of the fly wheel.

Instead of the vibrating arm, two circular discs may be substituted, upon a tube or hollow shaft, the one disc carrying a stud with the spur pinion, and the other having upon the one side a connection with the throttle-valve lever, and on the opposite side a spiral or other spring capable of adjustment. The spring may be attached at any other convenient point, say, the throttle-valve lever, if desired.

Instead of employing spiral springs in the ordinary way, the inventor proposes to employ the re-active force of a metal spring, coiled upon the main or rotating shaft or spindle of the apparatus, one end of such coiled spring being attached to the fly wheel, and the other to the spindle, so that upon any change of motion between the two the spring is caused to coil or uncoil, instead of its expanding or being elongated under strain, and shortening or returning when relieved. When the independent engine is employed to rotate one part of the apparatus, it should be caused to rotate at a higher speed than that of the pulley which receives motion from the main engine.

Proceedings of Societies.

INSTITUTION OF CIVIL ENGINEERS.

NOVEMBER 11, 1862.

JOHN R. M'CLEAN, ESQ., Vice-President, in the Chair.

BEFORE commencing the business of the evening, on this the first meeting of the session, and in the absence of the president, the Chairman said it was his duty to notice the loss the Institution had sustained by the death, during the recess, of two of its most eminent members—Mr. John Edward Errington, vice-president, and Mr. James Walker, past-president.

For upwards of thirty years, and indeed ever since the introduction of the railway system, Mr. Errington occupied a prominent position as an engineer, and, in conjunction with Mr. Locke, executed some of the principal railway works in Great Britain. He was, like his partner, Mr. Locke, a strong advocate for economy in the first cost of construction. By his death the profession had lost one of its most distinguished members, the Institution one of its warmest supporters, and many of us a sincere friend, and one ever ready to afford advice, especially to his numerous pupils and assistants, whose interests it was his constant endeavour to advance. As many of his pupils were actively engaged in the practice of the profession, and had, through his influence, been enabled already to take good positions, the Chairman expressed the hope that they would feel it a duty, no less than a pleasure, incumbent upon them, to communicate plans and descriptions of the works of their eminent masters, and so keep alive the memory of "Locke and Errington" in the Institution of Civil Engineers. Mr. Errington had proved his attachment to the Institution, and his desire to see it prosper, by bequeathing to it the sum of £1,000, free of legacy duty, and without attaching any condition whatever to the gift.

Mr. Walker was one of the oldest members of the profession, having been in active practice as an engineer for upwards of sixty years. He was also one of the earliest members of the Institution, having joined it in the year 1823, and, after the death of Mr. Telford, became its president. For a period of eleven years, during which he so ably conducted its proceedings in that capacity, he was most devoted to its interests, and to his zeal and energy must be greatly attributed the eminent position it held on his retiring from the chair in 1845. Mr. Walker's name was associated with many of the greatest hydraulic works in England and Scotland, including light-houses, harbours, bridges, embankments, and drainage. His opinion was much valued by the elder brethren of the Trinity House, by the Lords of the Admiralty, and by the corporation of the city of London, and it must not be forgotten, especially at the present moment, that twenty years ago he laid down lines for embanking each side of the River Thames, which have never been improved. As the Chairman had had the privilege of being in Mr. Walker's employment for many years prior to 1844, he had an opportunity of knowing his worth, and must express his gratitude for many acts of kindness, and state that it was Mr. Walker's constant endeavour to promote the interests of himself and others. Many members of the profession had also been trained in the same school, including Burges, Bidder, Hawkshaw, Borthwick, and Hartley. During his long and useful career he had secured the admiration and respect of numerous influential friends, as well as the regard of his professional brethren.

The Chairman had much gratification in announcing, that Mr. Walker, having left at Mr. Burges' disposal the twenty-five remaining copies of Telford's "Life and Works," as well as the copyright and copper-plates, Mr. Burges had, in the most handsome and liberal manner, presented them to the institution.

The paper read was on

THE RAILWAY SYSTEM OF GERMANY, by Mr. Robert Crawford, Assoc. Inst. C.E.

It was stated that in Germany, as in England, tramways had formed the germ from which subsequent enterprise developed the vast network of railways now extending throughout the length and breadth of the land. The oldest of these undertakings originated in a 50 years' "privilege," granted by the Austrian Government, upon the 7th September, 1824, for the construction of a line from Budweiss, in Bohemia, to opposite Linz, on the Danube—a distance of upwards of 80 English miles. Subsequently, a concession was obtained for a line from Linz to Gmünden, 42½ miles. The cost of the Budweiss, Linz, and Gmünden line was about £4,877 per mile. The gauge was 3 ft. 7½ in., and it was worked by horses until 1854, when small locomotive engines were employed, first upon a portion of the line, and in the following year upon the entire length.

A proposal to adopt steam as a motive power, instead of horse labour, was carried into effect for the first time in Germany in the case of a railway, 4 miles in length, from Nüremberg to Fürth, which was opened for public traffic on the 7th December, 1835. Thus Germany, possessing at the close of the year 1835, upwards of 108 miles of tramways, had, up to the same time, only 4 miles of railway properly so called. In the five following years, railways were introduced into all parts of the country, so that at the close of 1840, there were twelve railways, either wholly or in part finished, with a total length opened of 377 miles. In the next ten years this had been increased to 4,187 miles; by the close of 1860 to 8,512 miles, and at the end of 1861, a total of 8,866 miles had been constructed, at an average cost of £16,400 per mile. Nearly one-fourth of the entire length was provided with double lines of rails. About 38 per cent. of the existing lines was Government property, 10½ per cent. the property of companies, but worked by Governments, and 51½ per cent. the property of and worked by private or joint-stock companies. Further, it appeared that 93½ per cent. of the entire length was constructed by the different States, 24¾ by companies under a guarantee of interest, or a Government subvention, and 35¼ per cent. by companies at their own cost and risk; so that Government aid had been granted, directly or indirectly, to nearly two-thirds of the entire system. These 8,866 miles of railway comprised 62 different undertakings, as at present constituted, under as many different organisations, and were managed by 19 Government departments and 43 boards of directors.

At the close of the year 1861 Germany had, in addition to the railways, about 143 miles of tramways, constructed at an average cost of £3,200 per mile.

With a view of establishing a common plan of action, and of regulating, to a certain extent, the relations of the different railway companies with each other, a society was formed in the year 1847, under the title of "The Association of Government Railway Directions," which now embraced the whole of the lines, with very unimportant exceptions. Each company subscribed a fixed sum towards the general management fund, together with a variable amount depending upon its length, and was represented at the meetings of the Association and in the debates, in proportion to its importance. A code of laws had been drawn up and agreed to, which was revised from time to time, the rules expressing the decided opinion of the associated body upon all points usually involved in the construction and working of railways. The gauge was now universally throughout the country 4 ft. 8½ in. With regard to curves and gradients the rules laid down were—First, the radius of curvature should, if possible, not be less than 3,600 ft. in level land, nor than 2,000 ft. in hilly districts, except in particular instances, where it might be necessary to reduce it to 1,200 ft., or even, in very rare cases, to 600 ft., but never less. Second, the general scale of maximum gradients admissible on railways was 1 in 200 in level districts, 1 in 100 among hills, and 1 in 40 on mountain lines. Several examples of sharp curves upon works already executed were then noticed. The increased power of locomotive engines had led to a severer character of ruling gradients being introduced than was formerly contemplated, and there were ample proofs in every part of the country, that the limits recognised at present as suitable for the working of locomotives had been reached. Many instances were then given of steep gradients and sharp curves, including a particular account of the Semmering Railway, and the mode of working it. As, however, a description of this railway has been brought before the Institution by Mr. C. R. Drysdale, in the year 1856 (Minutes of Proceedings Inst. C.E., Vol. xv., p. 349), it would suffice to say, that the experience derived from the working of the line went to show, that one of the goods' engines was capable of drawing up the inclines of 1 in 40, at the rate of 9½ miles per hour, a train whose gross weight varied from 100 to 165 tons, according to the state of the rails and of the weather at the time. The ordinary rate of speed was fixed at—

	Ascending. Miles per hour.	Descending. Miles per hour.
For express trains.........	14 1-7	16½
,, ordinary passenger..	11⅝	14 1-7
,, goods, including military transport ...	9⅓	9⅓

The maximum number of trains which had passed over the line in one day was 72, counting both ways. This was during the Italian war. The ordinary number was 27, with from 7 to 8 carriages each. The line was about 25¼ miles in length, was laid with a double way throughout, and had cost £98,270 per mile.

It appeared to be a general, although not a universal plan, in the case of all main lines, to prepare the earthworks and masonry for a double way throughout, but not to lay the second line of rails until the success of the undertaking and the requirements of the traffic demanded it. Some of the heaviest earthworks executed up to the present day were then alludsd to, including one on the Southern State Railway of Bavaria, the greatest height of which was 172 ft., and which contained nearly 3,000,000 cubic yards of material. A list of the largest tunnels on the principal lines was next given.

Viaducts and bridges were treated under two headings:—first, bridges composed altogether of masonry, and second, iron bridges. The views of the Associated Railway Directions on bridge building were:—1st. For bridges, arches of stone or good bricks were preferable to every other description of structure, except in cases which required very oblique bridges. 2nd. Timber bridges were inadmissible. 3rd. When iron bridges were made use of, the portion of the structure which sustained the roadway should consist either of wrought or rolled iron. Thus cast-iron bridges, as well as timber ones, were removed from the field of investigation; the former by negation, and the latter by direct condemnation.

Instances were then adduced and details given of several examples of stone viaducts and bridges of imposing dimensions and extent, including those over the Goeltzsch and the Elser Valleys, on the railway from Leipzig to Hof; and the Neisse viaduct on the railway from Kohlfurth, to Goerlitz, in Prussia. The result of a series of experiments, for the purpose of ascertaining the best description of concrete to be placed round the foundations of the river piers in the latter case, gave the proportions most suitable for yielding a quick setting, hard concrete at 22 per cent. of cement, 22 of sand, and 56 of small broken stones, not exceeding 2 in. diameter. In regard to the bridge over the River Neckar, on the railway from Frankfort-on-Maine to Heidelberg, it was stated that the depth of the keystone was somewhat over the minimum required both by Desjardin's formula and by that of Gauthey; but, on the other hand, it was so out of proportion with the hugh thickness obtained from the method of Perronet, as to prove the total unfitness of this system for calculating cases similar to the one in question. Thus the

	Metres.
Neckar Bridge, as actually built had a depth of key of	1·200
,, according to Gauthey's formula it required	1·125
,, ditto Desjardin's	1·140
,, ditto Perronet's.................................	3·241

In the case of wrought-iron bridges, the arrangement most usually adopted, when the spans were wide, was that of a lattice construction in some one of its various modifications. One of the earliest examples, which was described in detail, was the bridge over the river Kinzig, at Offenburg, on the Baden State Railway, in which it was considered that the arrangement of the material was not judicious, as—1st, The dimensions of the ironwork were uniform throughout the length of the span. 2nd, Although a stronger lattice construction was adopted in the case of the central girder, still the top and bottom sections were of similar dimensions to the outside ones; and, 3rd, The cross sectional area of the iron had not been properly proportioned to its different powers to resist compression and extension, where those forces acted. The bridge over the river Vistula, at Dirschau, on the Eastern Railway of Prussia, was next referred to. It consisted of six spans, each 397 ft. 6 in. in the clear, the depth of the girders being 38 ft. 9 in., and the whole of the material in the superstructure being carefully proportioned to the nature of the strains to which it would be exposed. The Marienberg bridge over the River Nogat, on the same railway, was likewise minutely described. The next examples selected were those over the Rhine, at Cologne, and at Kehl, close to Strasburg; in the latter case the method adopted in constructing the foundations, by means of compressed air, was also mentioned. It was stated that the operation of sinking the foundations progressed at the rate of about 20 ins. per day of twenty-four hours.

In addition, there was also another bridge over the Rhine at Mayence, which consisted of thirty-two openings, having together a clear waterway of 3,134 ft. 6 in. lineal measure. The ironwork in the superstructure was somewhat similarly arranged to that of the Saltash bridge, modified, in some particulars, as to the cross section and the form in which the material was applied, according to what was known in Germany as the system of Professor Pauli, of Munich, which gave a rectangular top to the beam instead of an oval one.

Attention was then directed to the permanent way. It appeared that about seven-eighths of the of the rails in use were of the broad base, or contractor's pattern; the remaining one-eighth being composed chiefly of chair rails, with a small proportion of bridge-shaped ones. As to size, the rails were not less than 4½ in. in height by 2¼ in. width of head, and the surface was curved to a radius of from 5 to 7 in. They weighed generally from 66 to 76 lbs. per yard. Fish-plates were now almost universally adopted for connecting the ends of the rails, and the joints were always supported by a sleeper; a wrought-iron chair being interposed between the rail and the timber. Recently, a trial had been made of the modern English system of leaving the joint free without any sleeper under it, and the result had been so satisfactory, that it was intended to extend it. The almost universal system of supports was that of cross-sleepers. They were of oak, where it could be procured at a reasonable price; but different descriptions of larch and fir were often used, after being prepared by some chemical process to resist the tendency to decay.

The quantity and description of rolling stock in use on different railways in Northern and Southern Germany varied greatly; but as nearly as could be estimated, at the close of the year 1861, there were—

Locomotive engines	0·414	per English mile.
Passenger carriages, average 41·8 seats each	0·807	,,
Goods trucks, average load 6·9 tons	7·040	,,

Before any engine was permitted to be used its boiler must be tested with hydraurie pressure to at least one and a half times the maximum steam pressure, which it was intended to sustain, and a similar test must be applied after the engine had run its first 46,109 miles, and be subsequently repeated every time an additional 36,887 miles had been made. The rate of speed was usually, for express trains, from 27 to 35 miles an hour, for ordinary passenger trains from 20 to 25 miles, and goods train from 10 to 15 miles per hour, in each case exclusive of stoppages.

It was adnounced that the discussion, which had been commenced, would be continued at the next meeting, Tuesday, November 18th.

INSTITUTION OF MECHANICAL ENGINEERS.

THE general meeting of the members of this Institution was held on Thursday, the 6th instant, at the house of the Institution, Newhall-street, Birmingham; Charles F. Beyer, Esq., in the chair.

The secretary, Mr. W. P. Marshall, having read the minutes of the previous meeting, a number of new members were elected; and the officers of the Institution were nominated for the next annual election.

The first paper read was, "On a Packing for Pistons of Steam Engines and Pumps," by Mr. George M. Miller, of Dublin, which consists of two packing rings fitted into grooves in the piston, and pressed outwards against the cylinder by the pressure of the steam in steam-engine pistons, without the use of any springs. The steam is admitted behind the packing rings by two small holes opening from each face of the piston into the bottom of the nearest groove, whereby each ring in

turn is pressed steam-tight against the cylinder by the steam acting alternately on the opposite sides of the piston. Only one ring is thus in action at the same time, and when the steam is shut off the piston is free to move without any friction. The packing rings are of steel or brass, put into the grooves in the piston without any spring, the ends of the rings being made generally a simple butt joint at the division, and sometimes with a lapped or a tongued joint. These steam-packed pistons have been used for several years in the locomotives of the Great Southern and Western Railway of Ireland, and have proved thoroughly satisfactory and advantageous, the engines having run between 30,000 and 40,000 miles on an average with the brass or steel packing rings, before the rings required renewal, while one set of steel rings ran upwards of 90,000 miles before the rings were worn out; the cylinders have a highly polished surface, and their wear is found to be very slight. The same packing rings have been employed for some years with equal advantage in stationary engines with vertical cylinders. They have also been used for some years for pump buckets, the rings in this case being pressed outwards against the cylinder by the pressure of the water admitted behind them in the same manner as in the steam pistons; and the same plan of packing has also been applied to the gland packing of a pump plunger, the packing rings being in that case pressed inwards upon the plunger by the pressure of water round the outside of the rings. Specimens were exhibited of the steel and brass packing rings taken from the pistons of locomotive and stationary engines; and also of a pump bucket with brass packing ring that had been working constantly for more than two years.

The next paper was "On Machinery for the Manufacture of Gun Stocks," by Mr. Thomas Greenwood, of Leeds, giving a description of the entire series of operations that are performed by a set of machines for shaping and finishing the stocks for rifles. The whole number of successive operations is 23, each advancing the stock a step further from the original rough bar of wood towards its completion in the required form, as illustrated by a complete set of the stocks that was exhibited from each stage of the manufacture. Throughout the machinery the principle is carried out of copying the required shape from a pattern, by means of cutters revolving at a high speed, and guided by a tracer that follows the pattern. A detailed description was given of the lock-bedding machine, for cutting and shaping the recess in the stock to contain the gun-lock: and also of one of the cutting machines employed at a later stage for shaping a portion of the stock beyond the lock; and the two machines were exhibited to the meeting in complete working order. In the lock-bedding machine, five separate operations are successively performed to cut and shape the recess for the lock, with one fixing of the stock in the machine. The five cutters or drills are carried each on a vertical spindle mounted in a circular cage, which turns round loose on the centre vertical driving shaft of the machine; a plain cylindrical driving wheel on the top of the driving shaft drives each of the five drills by friction, by means of a small driving roller on the top of the drill spindle. The drill spindle is carried in a slide capable of being moved by a handle both vertically and horizontally round the circumference of the cage, and the gun stock is fixed on a horizontal slide below, moved longitudinally by a second handle; and by the combination of these three movements the lock recess is cut out in the stock by the drills, a steel pattern being fixed alongside the gun stock, which is followed by a tracer fixed parallel to the drill in the slide that carries the drill spindle. The five drills are all of different sizes, for cutting the different portions of the recess, and each drill is accompanied with a corresponding tracer of the same size. When one drill has finished its own particular portion of the work, the circular cage is turned round to bring the next drill into operation upon the stock. In the second machine shown, the contour of the stock is obtained from a cam of the required pattern, and the revolving cutter shaft is mounted in a rocking lever, the extremity of which is the tracer that follows the circumference of the pattern cam. The gun stock is fixed horizontally in the machine underneath the cam shaft and parallel to it; and the stock, together with the cam shaft, is turned slowly round by a hand wheel, while the cutters are brought up by a treadle. The cutters are set at a little inclination to the stock, so as to cut the wood with a paring-action and produce a smooth surface. In both the machines the gun stock that is being operated upon is bedded closely upon a fixed cylindrical bar that exactly corresponds with the barrel of the gun, and fits precisely in the groove made for it in the stock in one of the earlier operations; and this barrel groove serves as the fixed accurate basis for all the subsequent operations, insuring absolute identity in all the stocks. The other machines of the series are similar in the principles of construction, differing merely in the details of arrangement for performing the special operation intended. By the employment of machinery in this manner, strict accuracy of work is obtainad, and all the separate portions of the gun are interchangeable with any gun stock.

The last paper was a "Description of a Hydraulic Shears and Punch," by Mr. James Tangye, of Birmingham, consisting of a simple arrangement of hydraulic press in a compact and portable form, applied to the purposes of shearing and punching iron bars. In the shears, the upper shear blade is fixed in the frame of the machine, and the lower shear blade is carried on the top of the ram of the press cylinder, which forms the bottom of the machine, the water being pumped in by a small force pump worked by a hand lever. For enabling the water to escape from the press cylinder in lowering the shears after shearing a piece of work, the hand lever is depressed beyond the ordinary working limit, until a projection on the bottom of the plunger presses open the delivery valve, allowing the water to flow back from the press into the cistern. In the punch, the press cylinder is placed at the top and inverted, the ram carrying the punch. This hydraulic shears and punch afford the means of shearing and punching railway rails or bars of large section by the power of one man only at the hand lever; in shearing rails the shear blades are shaped to the form of the rail, so as to cut shear through the entire section at once and make a clean cut. The same construction of force pump and press is also applied as a portable hydraulic lifting jack, the ram of the press forming the foot on which the jack stands, while the cylinder is inverted and rises; the reservoir of water is contained in the head of the jack, from which the water is pumped by the force pump into the cylinder for raising the load, whereby a load of as much as sixty tons can be lifted by the power of one man with a portable jack. Specimens of the hydraulic lifting jack were exhibited, and also specimens of rails and bars sheared and punched.

The meeting then terminated.

Gossip.

New York papers, received by the last mail, contain an account of the trial trip of the "Paissac" turret battery, built on the plan of the "Monitor," carrying two guns in her turret, one of 11 in., and the other of 15 in. bore, the latter being the largest piece of ordnance that has yet been mounted on board any vessel. The following are the dimensions of the "Paissac's" monster gun:—Maximum diameter, 48 in; minimum ditto (rough), 38 in.; minimum ditto (finished), 26½ in.; bore, 15 in. The length of the gun is 13 ft. 7 in.; the weight of rough casting, 68,000 lb.; of the finished gun, 42,000 lb.; of the solid shot, 460 lb.; and of the shell, 330 lb. The maximum or service charge of powder is 35 lb. The speed attained by the "Paissac" on her trial trip was only five knots.

It is proposed to supersede the use of armour plates for ships by willow-wood of the thickness of a foot, having a steel rolled plate of one inch and a half inserted in the middle of the wood. This wood has the property of resisting compression to a great degree, and possesses the same cohesive and repulsive properties of steel. Whalebone, from its cohesion and tenacity, has likewise been proposed as an extra backing for the iron plates, placing the same between the iron and the teak or willow. Horn has its advocates as an additional backing.

The Great Eastern Railway Company will apply next session for powers to construct a line from its existing system, at March, to Spalding, on the loop line of the Great Northern, and from that point to obtain running powers over the Great Northern to Askerne. This is the "coal line" of last session, but it is brought forward in a modified form, so as to avoid the opposition which would otherwise be experienced from the Great Northern.

At the last meeting of the Manchester Scientific Society, Dr. Roberts exhibited some microscopic preparation illustrating the effect of a solution of magenta on the blood. The red blood-discs were tinted of a faint rose; and one portion of their outline, in a majority of the corpuscles, appeared more deeply tinted than the remainder. The pale corpuscles were more strongly tinted than the red; and their nuclei were displayed with great clearness, dyed of a magnificent carbuncle-red. A number of the nuclei were seen in the process of division, more or less advanced, and in some cells the partition had issued in the production of two, three, or four distinct secondary nuclei. There was evidence that these secondary nuclei were set free in the blood, and, by subsequent enlargement and change of form and chemical constitution, developed into red blood discs, which would therefore appear to be, as Mr. Wharton Jones first conceived, free cellæform nuclei, and not, according to the current belief, enlarged and altered pale corpuscles.

The tunneling of the Alps is being continued with great activity. It is expected that the actual advance of 3·8 metres every twenty-four hours will be carried up to 5·6 m., or even 6 m., so that, unless some unexpected accident should occur, the work will be finished in 1870. Some fears have arisen about insufficient ventilation of the tunnel, when finished; Engineers, however, fear there will be too much air. The two ends of the tunnel have a difference of level of 131 metres; they will, therefore, never be at the same temperature, and a current of air will thus continually traverse the tunnel.

ABESTOS PAPER.—In the Northern States of America abestos is found in rather large quantities, in fine, long, silky threads. The low price of this mineral, its power of resisting heat, and its low heat-conducting power, have led to experiments for using it in paper-making. This paper contains about one-third in weight of abestos. The paper burns with a flame, and leaves a white residue, which keeps the shape of the sheet if carefully handled. Any writing in common ink is perceptible even after the organic substance of the paper is consumed.

MALLEABE IRON NAILS.—Besides the very extensively employed machine-made nails, there is another description of nails getting into use, especially for fixing tiles on to the roofs of factories and similar buildings. These are nails of cast malleable iron. They oxydize much less in damp air than common iron nails, or even copper ones. To manufacture them, very hot metal is run into ordinary sand moulds. These malleable iron nails are very brittle before being placed in the annealing furnace. Their sojourn in the furnace renders them very ductile. They are then put into polishing barrels, in which they are cleaned, whereupon they are thrown into a zinc bath to obtain a coating. In a former number we alluded to a machine in the Exhibition for casting nails.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the Proprietors of this Magazine. Other Papers are hereby warned not to produce them without an acknowledgement:—

1157. A. MARKS. *Improvements in artificial feathers, applicable to certain ornaments of dress.* Dated April 21, 1862.

This invention consists in employing, for the above purpose, goose and swan feathers, either separately or in combination, in such manner as to admit of being sewn, or otherwise held together, through the medium of a stalk or stem, and, subsequently, shaped and finished as required, the said feather being previously cleansed and rendered soft and fit for being coloured, curled, or otherwise embellished. *Patent abandoned.*

1158. E. F. CLARKE. *Improvements in propellers for steam ships and other vessels.* Dated April 21, 1862.

This invention relates, firstly, to an improvement in the screw propeller. The inventor makes or constructs the boss of a semi-spherical form, preferably much larger than it has hitherto been made, and passes the driving shaft into or through it in the ordinary way. The flat side of such semi-spherical boss works against a smooth disc, or other smooth surface, fitted to or made part of the false stern post, of the same diameter as the boss; and the driving shaft trunk, to obviate resistance as a ship or vessel passes through the water, is enlarged, or made of about equal diameter, by which means, and the cutting off of the leading edges of the blades, which are cast with, or fitted to, the above-mentioned boss as at present, the trail of "dead water" and vibration will be prevented. The invention relates, secondly, to propelling apparatus, to be used in lieu of paddle and other side propellers. Instead of carrying ont the main shaft after it passses the hull of a vessel in a straight line, it is forged or fitted with a number of cranks, by preference three on each side, similar to the cranks used for working a set of three pumps. Parallel to the main shaft, and of the same form, the inventor places one or several crank shafts, resting on bearings fitted in or on the sides of the ship, and across to and on framework carried out for that purpose. Each set of cranks is coupled to connecting rods, which carry one or more floats, so jointed that they will "feather" out of the water at the turn of the stroke, and prevent back water, the motion being somewhat similar, where one float is used, to that adopted by the Indians in paddling a canoe, and where several are used, they move together like louvre boards. *Patent abandoned.*

1159. R. A. BROOMAN. *Improvements in packets or protectors for covering metal and other surfaces, to prevent loss of heat by radiation.* (A communication.) Dated April 21, 1862.

This invention consists in the employment of cords, bands, or fabrics composed of bristles or hairs, or of a packing of bristles or hairs, in their natural state, with which the surfaces are covered or surrounded on the outside. These materially will be found economical and durable, and do not readily carbonise. For protecting cylinders and cylindrical bodies the inventor uses ropes or bands of any kind of hair or bristles. For flat or irregular surfaces he makes the hairs or bristles into a woven or felted fabric, and fastens the fabric on such surfaces. *Patent completed.*

1160. F. TOLHAUSEN. *An improvement in horse shoes.* (A communication.) Dated April 21 1862.

This improvement in horse shoes relates to the means for rendering horses less liable to slip when the ground has become slippery by frost or from other causes. For this purpose the inventor provides in the horse shoe a suitable number of holes that are tapped and are intended to receive screw-points—that is to say, conical or pyramidal spikes, having a screwed portion and a square for screwing them into the horse shoe by means of a screw-key. These points can be taken out or removed in summer time, or when the ground is not slippery, and in that case he prefers filling the screw-holes by means of screws, the heads of which come flush with the horse shoe. *Patent abandoned.*

1161. T. ATTWOOD. *Improvements in kitcheners.* Dated April 21, 1862.

According to this invention the patentee makes the oven door in two parts, and so arranges the fittings, that, when open, the doors stand at right angles with the front. On the insides of the door he forms ledges or rests, which, with the doors in the open position above mentioned, are in a direct line with the ledges or rests of the oven, and in such manner that, when the doors are so open, they form a continuous slide on which the tray or shelf on which the meat or anything that may be cooking is placed can be drawn out of the oven for the purposes of basting, flowering, changing, or otherwise, which can thus be carried on with the greatest possible facility. An oven, furnished with one door only, might also be so fitted to enable which he projects a sliding piece on the opposite side of the shelf or plate sufficiently far behind to support that side of the plate when it is drawn out. The second part of the invention relates to a new mode of construction of the oven, which consists in making the lower flue stop and the bottom plate of the oven of one and the same piece of metal, which affords a greater amount of conduction of heat to the bottom of the oven, consequently, the desideratum of a greater amonnt of bottom heat is obtained. The third part of the invention relates to making the fire-door simply to slide, instead of being hung with hinges as usual. For this purpose he constructs and fits the fire-door to the kitchener so as to slide laterally behind the front plate of the boiler. This is a great advantage, both when such door is used as a regulator, and for roasting in front of the boiler. *Patent completed.*

1162. C. CALLEBAUT. *Improvements in sewing machines.* Dated April 21, 1862.

These improvements are applicable to shuttle-sewing machines, and the first part of the invention consists in the construction of a frame or mechanism for sewing transversally and longitudinally at option by means of a shaft placed underneath the machine; this frame forms one with the drawing hook or claw, and receives its motion from two cams fixed to the shaft working the shuttle; by pushing forward a lever for changing its action to the right and left, one of these cams is placed in communication with the frame, a double spring moved by the lever presses on the frame in a transverse and longitudinal direction, and two screws serve to regulate the length of the stitch in either direction. The second part of the invention consists in an ungearing or reversing mechanism, which the patentee applies to the shaft working the drawer, in order to change the direction of the drawing mechanism, and cause the stuff to return on itself to produce the superposed or stop stitches. This ungearing or reversing mechanism consists of a bevel-wheel, on each side of which is set another bevel wheel, the two latter being mounted on a horizontal driving shaft; this shaft is formed with a groove to allow of the said wheels sliding longitudinally, one of the cog wheels only gearing with that of the drawing mechanism; or a clutch may be used for reversing the motion. The driving shaft turns always in the same direction. If by means of a lever or handle one of the wheels on the shaft be put in communication with the wheel which puts the drawing mechanism in motion, the direction of rotation of the latter will be deterred, and the article to be sewn will be allowed to return on itself. The third part of the invention consists in replacing the handle or crank of the shuttle by a pinion wheel, catching into a wheel carrying a cam, which at each two stitches gives motion to the drawing hook or claw in a transversal direction, when the machine is set up for sewing in a longitudinal direction. He obtains by this means the lock stitch. *Patent completed.*

1163. A. DIXON. *Improvements in knife and fork cleaning machines.* Dated April 21, 1862.

We cannot here quote the voluminous details of this invention. *Patent abandoned.*

1164. J. C. AMOS. *An improved mode of, and improvements in, apparatus for supplying surface condensers with water, part of which improvements is applicable to blowers and rotary pumps generally.* Dated April 21, 1862.

The object of this invention is, first, to provide a ready access to the fan or impeller of rotary pumps, particularly when applied to the injection of water into surface condensers, and also when required to the fans of blowers. In the application of rotary pumps or impellers on ship-board, and also on land, the space that can be afforded them is frequently very limited, and great difficulty has therefore been found in providing means for removing the fan and working parts for examination and repair, the construction of the fan case (when not divided down the middle), requiring space to be left on both sides—on one side for the removal of the bonnet of the case, and on the other for giving the fan axle an end-way motion. The patentee now proposes to form the case in such manner that the mere removal of the cover will allow of the removal of the fan together with its axle and bearing. *Patent completed.*

1165. C. C. CREEKE. *Improvements in the construction of drain and other pipes.* Dated April 21, 1862.

In carryng out this invention the patentee moulds the pipes so that their ends shall lock the one into the other and draw tightly together. The sockets and flanges which he employs may vary in form, so as to present either one or two abutting surfaces; but in all cases he moulds these ends of the pipes with wedge-shaped projections and recesses, which, by an axial motion being given to one of the pipes, shall serve to draw the ends of the pipes together, and make a secure joint, preserving, however, until the joint has hardened the elasticity referred to. Before thus securing the pipes he inserts a suitable packing or cement between the abutting surfaces, and he also lubricates the entire surface of the socket and its counterpart, by which means, when the pipes are laid in place and screwed up, water or gas-tight joints will be secured. *Patent completed.*

1166. T. LEA and S. SMITH. *Improvements in burglary alarms or indicators.* Dated April 22, 1862.

According to this invention, upon a door, window, or similar moveable body, of or in a house or building, being attempted to be forced or opened, the same will be notified by an indicator which will at once indicate in what room or place this has happened, the same arrangements being in connection with arrangements for sounding an alarm or alarum, and for causing a match to strike against a friction lighter or striker, also for turning on a gas light, to be lighted by the said match, or for lighting a candle where gas is not available. *Patent completed.*

1167. E. H. C. MONCKTON. *Improvements in umbrellas, parasols, awnings, tents, and covering clothes, and in water-proofing the same.* Dated April 22, 1862.

The first process constituting part of this invention consists in passing the fabrics through a solution of wax and resin in hot oils of any description, and thence through or between rollers which, while expressing the greater part of the hot solution, will leave a sufficient portion thereof to render the fabric water or rain proof. The second process consists in the additions of so utions of gums and resins to oil and wax, melted together and applied as described. The third process consists in steeping the fabrics in a strong solution of soap and water, to which alum is then to be added till precipitation ceases, and subjecting it to pressure, by rolling or otherwise, so as to incorporate the soap and alum into the body of the cloth; the cloth, when dry, will be found to be for the most part waterproof; where additional security is desired, it must be further treated, as described. *Patent completed.*

1168. S. S. PUTMAN. *Certain improvements in machines for forging horse-shoe nails and other articles.* Dated April 22, 1862.

This invention cannot be described without reference to the drawings. *Patent completed.*

1169. C. E. ELLIOTT. *Improvements in the preparation of dried yeast.* (A communication.) Dated April 22, 1862.

For this purpose fresh thick sub-fermentative yeast is taken and stirred up with twelve times as much water, and it is then drained through a cloth used as a sieve into a clean vessel; it must be allowed then to settle well, and the water has then to be poured off. The sediment is again mixed with water, and the same operation is again twice repeated. After the third draining a beautiful white yeast is found as a sediment at the bottom of the vessel. This latter sediment is then to be stirred up with some purified carbonate of soda or potash, and rectified spirit, using ⅓ of an ounce of alkali to one pound of sediment, and ⅔ of an ounce of rectified spirit, and is then left to stand quietly for half an hour, and afterwards is poured into sacks and pressed dry. Half an ounce of gelatine is then added to every two pounds of yeast; the gelatine is boiled into a solid mass, and is mixed after it has become almost cold, first, with one pound of yeast, after proper kneading is thoroughly mixed with the other pound of yeast, and is rolled into a stick, which is then exposed for from ten to twelve hours to a cold temperature. After the lapse of this period the union has taken place perfectly, the stick is unrolled and cut with a glass knife into any form desired, and the pieces themselves are dried on frames covered with a cloth in an ordinary temperature. *Patent abandoned.*

1170. C. WEBSTER. *Improvements in self-acting fountains, adapted for garden-engines, fire-engines, and for raising and forcing water from mines, wells, and other places.* Dated April 22, 1862.

This invention consists in so constructing and arranging certain parts of self-acting fountains, and of charging such parts with compressed air, as to render the raising and forcing of the water from a reservoir contained in said fountains self-acting and continuous, according to the size of the reservoir. *Patent abandoned.*

1171. A. WARNER. *Improvements in the construction of vessels of war and in floating or other batteries.* Dated April 22, 1862.

The patentee prefers to form the outer skin of a plate or plates of iron of sufficient thickness to resist the action of ordinary shot or shell, and between this outer metal skin and the planking or timbers of the ship, or battery, he forms chambers or cells by the arrangement of the metal or timbers which support or form the outer skin, and these chambers or cells he afterwards fills up with molten metal, or with other materials cemented together, so as to form a solid and compact mass. *Patent completed.*

1172. J. H. JOHNSON. *Improvements in apparatus for propelling and manœuvring.* (A communication.) Dated April 22, 1862.

This relates to a peculiar mode of applying and actuating screw propellers, whereby greater command of the ship is obtained as regards steering, and the drifting on to a lee shore prevented. The inventor proposes to mount the axis of the propeller in a moveable frame, placed at the stern of the ship, and capable of turning through the half of a circle, so as to bring the propeller shaft at any desired angle with the keel. This frame may be turned by the usual means, or by other mechanical arrangements. The propeller shaft derives its motion by the aid of suitable bevel or other gearing from a vertical shaft, which forms the turning pivot of the frame, and this shaft receives its motion from the ordinary propeller shaft contained inside the ship through the intervention of a pair of bevel wheels. *Patent abandoned.*

1173. G. SCOVILLE. *Improvements in pistons for steam-engines.* (A communication.) Dated April 22, 1862.

The object here is to simplify and perfect the use and application of metallic packing for pistons of steam-engines, and to dispense with the use of springs or other mechanical contrivances for adjusting and regulating such packing. The packing rings are kept expanded against the inside of the cylinder by the pressure of the steam, instead of by springs. *Patent completed.*

1174. R. BOBY. *Improvements in the construction of apparatus for rolling or crushing land.* Dated April 22, 1862.

In carrying out this invention the axle tree on which the roller or rollers, or pressing wheels, are mounted, turns in properly lubricated bearings or grease boxes at each end of the frame, so that it may rotate therein with as little friction as possible. If the roller or clod crusher be composed of two or more parts or pressing surfaces, one or more of the parts or wheels may, if desired, be permanently or temporarily attached to the axle tree or spindle by ratchet wedges or other contrivances. The axle tree or spindle will be obliged to burn in its bearings, but the ratchet attachments of the rollers will allow the latter, when passing round curves, or when the implement is being turned round at the end of the field, to turn back or rotate on the spindle. By this arrangement the friction of the working parts will be reduced to a mimimum, and the power required for drawing the implement over the land will be lessened. The bracket ends or arms of the roller frame are provided with bushes or pairs of bearings, so that should any part be worn away, the damaged part may be removed and replaced by a second part. *Patent completed.*

1175. R. JINKS. *Improvements in apparatus for suspending, raising, and lowering venetian blinds, and for retaining them, and other blinds, and also curtains and sun shades, at any required height.* Dated April 23, 1862.

This consists in suspending venetian blinds by tapes or ribbons fixed to and winding round a roller, and in making such roller of less circumference in the parts where the tapes are fixed than in that part to which is fixed, and round which passes the cord used for causing the roller to revolve. Or in suspending the blind as aforesaid from a roller, made as described, or of uniform thickness throughout, which is made to revolve by a cord fixed to and passing round a wheel or reel of greater circumference than the roller and attached to the end of it, the object being to obtain leverage by passing the cord used to draw up or lower the blind round a greater circumference than that round which the tapes or ribbons pass. So far as the invention relates to apparatus for retaining venetian and other blinds, &c., at any required length, it consists in using an improved trigger and rack. *Patent abandoned.*

1176. L. HOLDEN. *Certain improvements in harness for animals of draught and burden.* Dated April 23, 1862.

This invention is not described apart from the drawings. *Patent abandoned.*

1177. W. MOIR. *An improved instrument for ascertaining the specific gravity of liquids.* Dated April 23, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1178. G. N. BATES. *Improvements in dressing lace and other fabrics.* Dated April 23, 1862.

The patentee claims the use for the above purpose of an amalgamation or combination of bees'-wax and gelatine, or of an agent produced by combining or amalgamating bees'-wax or sperm-wax with gelatine. *Patent completed.*

1179. G. H. BIRKBECK. *Improvements in lubricating apparatus.* (A communication.) Dated April 23, 1862.

This consists in so arranging apparatus that a sufficient quantity of oil is constantly supplied to lubricate the parts required, whilst they are in motion, the supply of oil ceasing whilst they are at rest. The apparatus is also so arranged that any excess of oil raised thereby, at once flows back into the oil vessel, without being deteriorated by coming in contact with the moving frictional surfaces. *Patent completed.*

1180. W. CARPENTER. *An improved method of printing in colours.* Dated April 23, 1862.

This consists in an improved method of printing in colours in cases where four colours, and where from four to twenty-four varieties or transpositions of these colours may be required, with ordinary presses or machines from one form or surface, and with one making ready only. To work this method, the patentee divides the matter into four parts, making them up to one gauge, and imposes or places the said sections or parts in any desired way, provided only that the same relative corner of each shall point towards the centre of the whole form or surface to be printed from, equal space being left between each section or part. After making ready, he works all the sheets required in one colour; he then turns the sheets round in any direction, and works them in a second colour, when he turns them again and works in a third colour, and then again for a fourth colour, thus obtaining four varieties of the design of four colours in each. If the whole number of varieties, viz., twenty-four, be required, nothing more is needed than to turn a portion of the sheets in the second, third, and fourth positions before working them in the second colour, and the same for the third colour, and finish them in the only remaining position in the fourth colour, thus producing six kinds of sheets of four varieties on each, or twenty-four single varieties of four colours in each. *Patent completed.*

1181. J. PRICE. *Improvements in spikes for railways and other purposes, and in the mode of manufacturing and securing the same.* Dated April 23, 1862.

This consists in making an ordinary solid spike or pin, and then splitting it longitudinally for a greater or less portion of its length by a circular saw or shears. When the material to be used in the spike is a softer metal, such as copper or white metal, the inventor proposes to form the spike either by having it cast with the split and bevelled points, or by the process above described. The two limbs or halves thus formed are bevelled inwards at the point, which causes their opening or separation when driven into the sleeper or other timber. In order, however, to insure with greater certainty, the opening of the split end of the spike or pin, he proposes to use a small iron, metal, or hard wood, wedge, cone, pyramid, plug, or ball, which is dropped into or inserted in the hole to receive the spike, which hole is to be bored to about the depth to which the solid portion of the spike will reach when driven home, and upon which the bevelled end of the spike is driven, such wedge or cone serving effectually to open or separate the split. *Patent abandoned.*

1182. A. ROBERTSON and R. BARTER. *Improvements in apparatus for distributing and projecting fluids either for surgical, sanatory, or domestic purposes.* Dated April 23, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1183. W. FEAR, JUN. *Improved arrangements for joining the saw-plates of veneer and other saws constructed in segments.* Dated April 23, 1862.

Where the edge of one saw plate abuts against the other, the inventor makes an orifice, part of which is through one plate and the other part through the other; into this orifice he fits a copper or other suitable bolt, which is passed into the orifice, and then the thin end is flattened out, so as to rivet and secure the bolt firmly in its place, whereby any two abutting plates are kept fast held together, and the ends of the rivet may be made flush with the surface of the saw-plate or other plate, and will in wear always keep flush. *Patent abandoned.*

1184. A. HODGKINSON. *A mixture or composition to be used in the process of boiling, preparing, or bleaching vegetable substances, whether they are in the manufactured or unmanufactured state, which mixture may also be used in the manufacture of soap.* Dated April 23, 1862.

This consists of any oil or distillation of wood or coal, or stone, or petroleum or rock oil, or paraffine, in combination with lime or caustic soda, or common soda-ash. The patentee proposes to use the oil in the proportion of one to one and a half or two gallons, in combination with any of the above alkalis, in a solution of a strength or density to stand from two to four degrees of Twaddle's hydrometer, varying the strength according to the quality of the fabric to be operated upon. The mixture may be used as a soap if required, or it may be added to the alkaline, rosin, and fatty matters ordinarily used in the manufacture of soap.—*Patent completed.*

1185. J. H. JOHNSON. *Improvements in apparatus for taking deep sea soundings, and for recording the speed of ships.* (A communication.) Dated April 23, 1862.

This consists in the use for that purpose of a set of revolving screw blades, which are connected with the indicating mechanism by a suitable ratchet coupling, so as to be held in gear therewith when descending to the bottom in taking soundings, or when being drawn through the water, when used as a log, by the resistence of the water itself, and thrown out of gear by concussion upon the bottom or by the resistance of the water when ascending, thus allowing the blades to turn without moving the indicating apparatus during the raising of the apparatus. The details of the invention are voluminous.—*Patent completed.*

1186. G. T. BOUSFIELD. *Improvements in the construction of elliptic springs for wheel carriages and other purposes.* (A communication.) Dated April 23, 1862.

The patentee claims the combination of the arched leaves of a spring, with an arched tie bar, substantially as set forth. Also the combination of the arched spring leaves and arched tie bar by a head on the tie bar, against the shoulder of which the end of the adjacent spring leaf abuts, substantially as described. Also the combination of two sets of spring leaves, and two tie bars, by a clasp embracing the adjacent heads of the tie bars, substantially as set forth. Also the combination of the spring tie bar and spring leaves, so that the spring leaves may be flexed a certain distance before the pressure is propagated to the tie bar to extend it longitudinally, substantially as set forth. *Patent completed.*

1187. A. V. NEWTON. *Improvements in looms for manufacturing tufted pile fabrics, and in the mode of operating such looms.* (A communication.) Dated April 23, 1862.

This relates to a previous patent, dated 17th May, 1856 (No. 2434), and consists, firstly, in an improvement in the manner of mounting the warps in the loom, and in the operation of the harness, whereby the tufts are more effectually secured in the fabric, and a better web or back produced than can be effected by the loom described in the specification of the patent above mentioned. Secondly, In an improvement in the mechanism for transferring one by one the frames which carry the spools on which the tufting yarns are wound of the various colours required for each range of tufts in the design or figure to be woven. Thirdly, in an improvement which may be denominated the combing operation. Fourthly, In an improvement in the mechanism for cutting off the tufts from the yarns on the spools, by which that operation is rendered more perfect and the mechanism simplified. And, lastly, in an improvement by which the chafing of the warps experienced in the use of the loom is prevented. *Patent completed.*

1188. W. E. NEWTON. *An improved fertilising composition.* (A communication.) Dated April 23, 1862.

This new fertilising composition is composed of animal charcoal, sulphuric acid, and liquid animal matter, in certain proportions. *Patent completed.*

1189. W. E. NEWTON. *Improvements in the manufacture of imitation lace, net, or openwork fabrics.* (A communication.) Dated April 23, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1190. C. E. HEINKE. *Improvements in diving helmets, dresses, and apparatus, parts of which improvements may be also employed for extinguishing fires in ships and other confined places.* Dated April 23, 1862.

This relates, first, to the pump, and consists in constructing it as a three-throw pump, for supplying air to divers, the several parts being so arranged as to throw or force air and water at the same time, but through distinct and different hose. It also consists in increasing the depth of the breast-plate, so that it may cover the chest and the region of the lungs, so as to protect the lungs from the heavy pressure of the water. The boots are made of canvas, coated with india-rubber. *Patent completed.*

1191. J. ENDEAN. *Improvements in cocks, taps, and valves.* Dated April 24, 1862.

This consists in the following arrangement of parts:—A duct, or ducts, is or are formed with a cock, tap, or valve-shank, as it is termed, having a chamber or valve-box, provided with a solid or partially solid enlargement of the said duct or ducts, of conical or conoidial form, with the requisite apertures therein, and upon this conical or conoidial part is fitted a hollow cone or conoid correspondent thereto, provided also with apertures communicating with the ducts and ways, adapted so that the steam, gas, water, or fluid will enter the valve-box or chamber, pass over or against the said hollow cone or conoid, and out at the outlet or outlets, this hollow cone or conoid being provided with a stem, spindle, or handle, passing through the chamber or valve-box aforesaid, whereby the hollow cone or connoid may be turned, so as to bring the aperture therein upon, to, or away from the apertures in the aforesaid enlargement of the duct or ducts, and thus open and shut the same, as desired. The patentee arranges the apertures that the inlet shall never be closed and hence the hollow cone or conoid shall always be kept held to its seat with an equal pressure on its centre surface. *Patent completed.*

1192. W. HAGGETT. *Improvements in locomotive engines and carriages for railways, part of which improvements are applicable to carriages and vehicles for train and common roads.* Dated April 25, 1862.

The documents relating to this invention cannot, at present, be seen, an extension of time for filing the final specification having been petitioned for.

1193. H. WHEATLEY. *Improvements in or applicable to the employment of steam for heating or drying purposes* Dated April 24, 1862.

The patentee claims the application and use of a pump for drawing off the condensed water or steam from steam piping, and returning the same to the boiler or steam generator, or to be used for other purposes. *Patent completed.*

1194. J. BOND. *Certain improvements in projectiles, which improvements are applicable to horns attached to vessels for war purposes* Dated April 24, 1862.

These improvements are principally adapted to projectiles for smooth-bored guns, but they can also be efficiently used in rifled barrels. In performing the invention, the projectile is cylindrical and elongated, and the forward end is recessed to receive a charge of fulminating or other exploding powder, and a plug, either with a percussion cap or not. The body of metal around the ecess forms a punch, which penetrates with facility the armour plates or other body against which the projectile strikes, and when the projectile has peneteated to a certain depth, which can be regulated by the shape and position of the plug, the projectile explodes and enlarges the hole. In using the projectile for smooth-bored firearms and ordnance, a taper plug is used, and the projectiles are made with diagonal grooves. In applying these improvements to the horns of vessels for war purposes, the exterihr plug may be dispensed with, and the recess containing the charge must be hermetically closed in any convenient way. *Patent completed.*

1195. W. D. RUCK. *The manufacture of grease from coal tar, coal oil, creosote, or dead oil.* Dated April 24, 1862.

This consists in obtaining a certain grease from coal tar, coal oil, creosote, or dead oil. The inventor takes either of these, and treats it with sulphuric or other suitable acid. He heats it, and runs it into cold water. It is to be well stirred, and the grease then forms in lumps at the bottom of the vessel in which it is so treated. The grease is to be pressed to extract the water from it. It is then suitable for lubricating purposes, and also for candle making, when mixed with other substances. *Patent abandoned.*

1196. J. WINSBORROW. *Improvements in wet gas meters.* Dated April 24, 1862.

The object here is to facilitate and render more uniform the supply of gas by wet gas meters. For this purpose the inlet valve, in place of being applied direct to the float, is attached to it by leverage, so that when the float rises and falls a short distance, the distance of motion of the valve is increased in proportion to the difference in the length of leverage employed. The float moves in a chamber sealed above the water line from the inlet valve, so as to have gaseous communication only with the measured gas chamber. *Patent completed.*

1197. G. DAVIES. *Improvements in the manufacture of matting and in apparatus for the same.* Dated April 24, 1862.

The patentee claims, first, the manufacture of mats or malling of coir, having the pile or cut surface raised from strands or warps placed parallel with the warp of the backing or foundation, as described. Secondly, the arrangement of parts described, combined with a loom for weaving coir mats for the purpose of receiving and operating threads or strands introduced in the warp for the production of the pile as described. *Patent completed.*

1198. J. A. TRAVERSIER. *Improvements in making ladies' bonnets.* Dated April 24, 1862.

Here the body of the bonnet is composed of metallic wire for supporting the material forming the front and back of the bonnet; this wire is united to hinged and spring branches, so as to support the bonnet and form it according to the fashion. These spring branches allow of opening and closing the bonnet. When closed it takes up little space, and is able to retake its form instantaneously. The bonnet is provided with a pin to keep the bonnet on the head. *Patent abandoned..*

1199. J. F. ALLEN. *Improvements in slide valves and value gear for steam engines.* Dated April 24, 1862.

The nature of this invention consists, 1, In the use of a valve which, in that form of it which is adapted to perform only the single office of admitting or of releasing the steam, has a cavity in the face, and in that form which is adapted to perform the double office of admitting and releasing the steam, has a passage over the cup, which valve, moving on a seat of corresponding form, uncovers at the same time two openings for the passage of the steam into one part. In steam engines it is desirable to uncover a large area of steam port or passage by a slight movement of the valve, especially at that part of its movement where it is commencing to uncover the port or passage, and also to close the same as quickly as possible, whereby in the case of admitting and cutting off the steam, the wasteful effects of wire drawing are, in a great measure, avoided, and, in exhausting, speedy release is attained. *Patent completed.*

1200. G. W. BELDING. *Improvements in harrows or cultivators.* (A communication.) Dated April 24, 1862.

This relates to the teeth of harrows. Both single and double frames are employed for adapting the implement to a variety of soils and uses. The double frame consists of three pieces of suitable dimensions; the two outside pieces which in use diverge from the centre piece, are made adjustable, and may be brought parallel for convenience of transportation and storing. The drawing power is applied to the centre piece, and to this is fixed the front tooth. The single frame consists of one straight piece, to which is fixed one row of teeth only. This frame is drawn by an arm attached to the centre of the harrow or cultivator, and carried forward more or less diverging from the body of the implement, according to the depth of cultivation required. The teeth are constructed with broad thin coulters descending in a backward direction for the purpose of cutting the sod, and also to prevent their clogging. To the back and lower end of each coulter is attached a mould board. The lower edge of the coulter extends slightly below the mould, so as to raise the implement over stones or other obstrnctions when in motion, and also to protect the teeth from injury. The teeth in both frames are similar in shape, with the exception of the front tooth of the double implement, which is constructed with two mould boards or diverging wings. The front tooth turn furrows outward in opposite directions, while the succeeding teeth turn the furrows inward. In the single frame the teeth which are fixed obliquely, in reference to the length of the implements, and nearly in a line with the arm, all turn furrows in one direction, leaving the land perfectly smooth. *Patent abandoned.*

1201. F. DANGERFIELD. *Improvements in lithographic or zincographic presses.* Dated April 24, 1862.

The patentee claims placing the printing cylinder over, and the scraper box under, the bed, which is made to turn over, to move to and fro, and to receive pressure from the scraper by bolts acting against an eccentric or cam, as described. *Patent completed.*

1202. R. MUSHET. *An improvement or improvements in the lining, repairing, or fettling of puddling furnaces.* Dated April 24, 1862.

This consists in employing that refractory ore of litanium, called ilmenite, for lining, repairing, or fettling the sides of the puddling furnace, in order the better to enable the sides of the said furnace to withstand the action of the iron, slag, or cinder generated during the puddling process. "Bull dog," or hematite iron ore may be used in mixture with ilmenite for "fettling" puddling furnaces according to this invention, but the additton of these substances ("bull dog" iron and hematite iron ore to ilmenite for

repairing or fettling the puddling furnace) is not essential to the success of the invention. *Patent completed.*

1203. J. OFFORD. *Improvements in carriages.* Dated April 24, 1862.

Here the inventor improves the wheels by constructing the nave, stock, or centre part of wrought iron, forged whole, bored, and hardened, so as to prevent the necessity for a separate axle-box, and tapped so as to receive the spokes, which he also makes of wrought iron or other metal, and screws into the nave. In forming the felloes or rim of the wheel, he introduces a laminated principle of construction, using wood, vulcanite, india-rubber, and iron or steel, or other suitable material. The invention also comprises improvements in the steps of carriages, whereby more space is afforded for the foot, and the step rendered self-acting and noiseless. *Patent abandoned.*

1204. R. ZIMARA. *Improvements in stoves for heating and ventilating buildings.* Dated April 24, 1862.

One of the principal objects of these improvements in stoves is so to construct and arrange the flues and air passages thereof, that the air in its passage to the interior of the building may be heated by pressing through a series of pipes or passages composed entirely of earthenware. *Patent completed.*

1205. J. W. ASHBY. *Improved apparatus for obtaining motive power from the wind.* (A communication.) Dated April 24, 1862.

Here a shaft is mounted (at a suitable elevation) vertically on a foot step, and secured at its upper end by means of stay rods or ropes, attached to a collar in which the shaft is free to turn. Mounted horizontally on this shaft is a series of cross arms, which are intended to receive sails that are to be spread on skeleton frames attached to the opposite extremities of the several arms. These arms are arranged in pairs, and there may be one, two, or more pairs set one above the other at suitable distances apart to allow of the wind acting freely upon them. The cross arms are so mounted that they are free to receive an axial motion to the extent of about 45°, in order to yield to the pressure of the wind. The cross arms of each pair are mounted so as to cross each other at right angles, and the skeleton frames of each cross arm are fixed so as to be at an angle of about 45°. Thus the pressure of the wind upon that sail which is presented to the wind, will cause it to take a vertical position, and present its head surface to the breeze, and at the same moment the position of its corresponding sail will be shifted so as to present the least possible resistance thereto: *Patent abandoned.*

1206. S. C. SALISBURY, *Improvements in the construction of sewing-machines.* Dated April 25, 1862.

The chief object of this invention is to manufacture sewing-machines that shall be equal to heavy work, such as boot-sewing and the sewing of coarse clothing. To avoid the vibration which attends the working of machines with a revolving lever or levers, for operating the vertical needle and presser foot, the inventor proposes to employ a novel combination of parts, which enables him to work the needle and presser, and also the shuttle, from cams on the driving shaft, which shaft is mounted above the table of the machine. The cam shaft is mounted in a hollow bracket arm, and carries at its extremity a compound cam. A groove in this cam receives a bowle from the pendant arm of a crank lever, which has its fulcrum on the bracket arm. The other arm of this lever is connected by a link to the vertical needle bar, and through this arrangement the vertical movements of the needle are obtained. A second crank-lever, mounted on the bracket arm, and set at right angles to the first-mentioned lever, is operated by the inner face of the cam, and, while reciprocating, it strikes on the under side of a pin projecting from the stem of the presser, and lifts the same from the work. A spring, as usual, serves to return the presser to its pressed position. The feed motion is effected by a cam projection on the outer end of the cam, acting upon one end of a rock lever, the other end of which carries a pin that bears upon the inner edge of the presser foot stem. Every rotation, therefore, of the cam-shaft will impart a rocking motion to the presser foot, and thereby effect the feed of the cloth up to the vertical needle. For taking up the slack thread, he employs a swinging arm pendant from the vertical needle guide-box, through the end of which the thread is passed on its way to the eye of the needle. A crank-pin on the end of the cam-shaft gives this arm a movement outwards at the moment the slack is made, and thus the slack thread is drawn on one side. *Patent abandoned.*

1207. F. BARNETT. *Improved electric danger signals for railways and other cognate purposes.* Dated April 25, 1862.

Here it is arranged that, between all stations on railways, there shall be on each side of the line (for the up and down trains) tall posts erected, surrounded by round balls, or other shaped signals, to work in grooves, and be sustained in their places each by a catch connected with a galvanic pile or battery. The communication between the said pile or battery, and the moveable ball or other shaped signal, shall be at the station on either side of the said post or posts supporting each a moveable ball, or other suitable signal, of whatever shape, by which connection the person at the station, or elsewhere, in charge, will be able, by completing the circuit of electricity, to cause these moveable signals to fall, at the distance of many miles, from the upper to the lower part of the groove on the signal post; this, during the day, giving abundant notice to drivers to arrive cautiously and avoid collisions. For night signals, the inventor proposes that the same, or other similar tall signal posts, shall be surmounted by electric lamps, having the half only clear facing the arriving train, and the other half dark, to avoid misleading trains coming in an opposite direction. *Patent abandoned.*

1208. G. RICHARDS. *Improvements in ordnance and the manner of loading such with the charges and projectiles suitable thereto.* Dated April 25, 1862.

This invention consists, firstly, in an improved method of rifling guns, in order to give a greater initial velocity to projectiles than has hitherto been given by the system of rifling at present in use. This improved rifling consists of two or more projections or rails (instead of grooves) upon the inner surface or bore of the piece, the shape of which projections the patentee at present prefers to be that resembling an U in cross section. It consists, secondly, in improvements in the method of loading ordnance, as follows:—The cannon is to be perforated or pierced at the breech; the loading and sponging are to be effected by a metal rod, wire, or rope, passing through the perforation and thence to the muzzle; the charge is to be entered at the muzzle and drawn by the rod wire or rope into the chamber of the gun, and there discontinued, when necessary, in readiness for firing; the sponge is also to be entered at the muzzle. The breech is furnished with a revolving disc, segment of disc, or other stopper for closing the perforation when required. The perforation may ultimately be used as a "touch hole," and the stopper may be used as a cutter to sever the wire or rope when either of the latter is used in loading. The invention refers, thirdly, to the charges and projectiles suitable to this invention. He prefers at present to make the cartridges for the improved method of loading with a central longitudinal perforation, through which the loading rod passes and is connected with the face of the shot or sabot; they may also be made with indentations at the sides to take the rifling. The method of connecting the loading rod with the shot or sabot, at present, is by means of a screw, and also a shot and stud similar to a bayonet catch. *Patent completed.*

1209. J. F. BRUNET. *Improvements in the manufacture of fringes.* (A communication.) Dated April 25, 1862.

This relates to the fixing or consolidating the twist of fingers by caloric action, and to improveed machinery for making the twist. The machinery used consists of a reciprocating sliding carriage, working on a bed, and holding another sliding carriage in a manner similar to a compound slide rest. *Patent abandoned.*

1210. R. C. MANSELL. *Improvements in the construction of wheels to be used on railways.* Dated April 25, 1862.

This consists in making certain combinations of grooved, filleted, or flanged tyres, in connection with grooved, filleted, or flanged plates or rings for securing the tyres on to the bodies of wheels, and preventing the said tyres flying off in the event of their breakage, and grooved, rivetted, and flanged rims of wheels and other appliances in connection therewith. In making these combinations the patentee uses the securing plates or rings in connection with the tyres and rims of wheels, and also with the tyres only, and he makes the tyre or tyres and rims with a groove in, or fillet, or flange, on either one or both of their sides, and he makes the securing plates or rings of any form in cross section that may be required to fit the section of the grooves in, or fillets or projections on the tyres, or in or on the tyres and rims of wheels, so as to grasp the same. *Patent completed.*

1211. P. R. DRUMMOND. *A revolving rake.* Dated April 25, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1212. J. T. DAVIES. *Improvements in circuit horse powers.* (A communication.) Dated April 25, 1852.

This invention is not described apart from the drawings. *Patent abandoned.*

1213. R. P. ROBERTS. *Improvements in the preparation of paper for copying letters and other documents, and in the preparation of copying ink.* Dated April 25, 1862.

Here the inventor impregnates the paper with a material which, when a document written in ink is pressed against, will be acted on by the ink, and thus produce a copy of the writing. The material employed for this purpose is glycerine, or glycerine together with tannin or oxalic acid, or glycerine together with sub-carbonate of potash, or glycerine together with tannin and sub-carbonate of potash. The paper, after having had these materials applied to it, may be made into books, and letters, &c., may be copied upon it by placing the letters on the paper and pressing the book in a press. The improvement in copying ink consists in combining glycerine, molasses, and the seeds known as albamoschus with ink making materials. *Patent abandoned.*

1214. J. ELDER. *Improvements in steam-engines and boilers.* Dated April 25, 1862.

This invention relates to improvements in steam-engines of the class known as "Randolph, Elder and Company's combined cylinder engines," and to improvements in steam-boilers suitable for the same, and for other kinds of steam-engines. A first improvement in the engines consists in constructing and arranging the valves, ports, and passages between each low pressure cylinder, and the high pressure cylinder, so that when the valve is admitting steam from the latter to the former, only a comparatively small amount of admission opening (one port for example) is uncovered, whilst the same travel of the valve in the opposite direction will put a comparatively large amount of opening (one or more parts for example) in communication with the exhaust passage. A second improvement relates to the modification of valve gearing in use with the same class of engines, wherein the eccentrics mounted on a separate shaft, or on a tubular shaft, are reversed by the action of spiral grooves or feathers on such shaft on moving it longitudinally. A third improvement relates to the working of four cylinders when arranged to act in pairs on cranks at different angles. Hitherto two of such cylinders have received steam direct from the boiler, the other two receiving the steam which has already acted in the first two. According to the present improvement, however, but which is designed only for steam of very high original pressure, the steam from the boiler works in one cylinder and then in a second, from which it is made to pass into a chamber wherein it may or may not be superheated. From this chamber it is next made to pass into and work in the third cylinder, and finally works in the fourth one, from which it passes to the condenser. A fourth improvement relates to the design or arrangement of the parts of four-cylinder engines combined with surface condensers. The improvements in steam-boilers are applicable to the class of boiler in which the fire gases act directly upon a series of tubes containing the water, and they consist in arranging the tubing and other parts, and in applying apparatus in such a way that the water may circulate through the tubing in a downward direction, the opposite to the direction of the fire gases. *Patent completed.*

1215. J. SHAW. *Improvements in steam and other power engines and indicators.* (A communication.) Dated April 25, 1862.

This consists, 1, in certain improvements in the arrangement of equilibrium valves for the admission of steam to the cylinder, and in similar valves for its egress, rendering the same more efficient for the economical working of steam, especially when used in conjunction with the equilibrium and flexible piston described; 2, in an equilibrium and flexible piston that may be run with safety with little clearance in the cylinder ends, avoiding thereby a considerable amount of the loss of steam now caused by this clearance; 3, in governing apparatus of great compactness and sensitiveness, capable of being arranged so as to act as a speed indicator, applied to an eqilibrium valve, in which certain improvements are made to greatly reduce the friction of its working parts, such apparatus being applicable alike to stationary, moveable, and marine engines, whether worked by steam, air, gas, or water, by which the speed of such engines may be kept at any required rate, though they be subjected to great variations of load. *Patent completed.*

1216. J. ASPINALL. *An improved apparatus for the safe conveyance from sea to land of ship's papers, documents, money, and other valuables when wrecks or other casualties occur at sea* Dated April 25, 1862.

This consists of various thicknesses of cork fastened together, through the centre of which an aperture is made sufficiently large to receive a water-tight brass or other metal tube or vessel, which is to be inserted and fixed therein, the mouth of the tube or vessel being enclosed with a cap, which is to be secured thereon, so as to secure any letters or papers, or valuable articles, in the tube. The cork is enclosed in a case of sheet copper, zinc, or other metal, and to the exterior of this case a brass plate may be soldered, or otheswise secured, on which the name of the ship, owner, &c., may be stamped. These buoys may be of various sizes and shapes. *Patent completed.*

1217. C. REED. *A new method of treating the sorghum saccharatum or holcus saccharatus in order to obtain saccharine liquor and pulp therefrom.* Dated April 25, 1862.

This invention consists in taking the plant, after it has been cut, and in passing it between rollers, or in subjecting it to pressure in a hydraulic, or other suitable press, to express the juice and partially prepare the fibre. After the juice has been expressed, or the dry plant may be taken unpressed, the plant is cut, subjected to a boiling caustic alkali, is bleached, and converted into pulp in a pulping engine. The juice expressed may be evaporated and converted into sugar, or it may be distilled to produce a spirit either process being performed in the ordinary manner of sugar making and distilling. *Patent abandoned.*

1218. A. C. KIRK. *Improvements in refrigerating apparatus.* Dated April 25, 1862.

This relates to a peculiar arrangement and combination of apparatus for producing cold by the alternate compression and expansion of air, or any inconsiderable and elastic gas, and consists in alternately compressing and expanding the air or gas in a vessel having a moveable piston, and provided with a suitable regenerator, through which, on the piston being moved to one end of the vessel, the enclosed air may pass freely to the other end, giving out its heat or absorbing heat from the regenerator as it passes through it. The piston is caused to move so that the air, whilst being compressed, will always be at one end of the vessel, which the patentee calls the hot end, and, whilst being expanded, will be always at the opposite or cold end of the same, the regenerator preventing the conveyance of heat or cold from one end of the vessel to the other. The heat generated during compression is removed by exposing that part of the vessel to a current of cold air, water, or other cooling medium, whilst the cold produced at the other end by expansion is used to refrigerate any liquid or substance which may be brought in contact therewith. *Patent completed.*

1219. A. APPLEGARTH. *Improvements in printing in colours, and in apparatus to be employed for this purpose.* Dated April 25, 1862.

For the purpose of printing a sheet in several colours, the inventor fixes the paper, or material to be printed, in a frame which holds securely the edges, and it may be other parts of the sheet. In printing he employs a number of such frames, they are entirely separate from the printing press, and have the sheets placed in them by hand labour. The frames are all made of exactly the same length and breadth. The series of printing blocks (one for each colour) are arranged truly in a straight line or lines, one behind the other, and their distances apart are made accurately to correspond. The frames, containing the sheets to be printed, are laid in succession on the bed of the press, and they are kept against a guide rail thereon, so that they may be accurately one behind the other, and the last frame of the series is pressed up to a stop at the end of the bed. In printing, the series of blocks arranged as above described, one behind the other, are brought in contact with the corresponding series of frames containing the sheets to be printed, and each block prints its own colour; then the end frame of the series is removed, and the remaining frames are pushed on until they are stopped by the stop at the end of the bed, a fresh frame being introduced at the commencement of the series. The blocks then produce another series of impressions, each sheet being there printed with two colours, which it will be seen will exactly register the one with the other. In this manner the work goes on, the sheets being impressed in succession with each of the colours, and this being done the frames containing them are removed at the end of the series. *Patent abandoned.*

1220. W. HALE. *Improvements in rockets.* Dated April 25, 1862.

The object of these improvements is to insure a more correct line of light and longer range in the employment of war rockets than can be obtained by any other arrangement hitherto made use of, and also to effect a rapid rotation in

the rocket without having any of its power subtracted for that purpose, so that the whole power of the gas shall be exerted in giving the onward motion, whereas in the patentee's former improvements in rockets one-third of the whole power is devoted to the exclusive purpose of effecting rotation, and but two-thirds of producing the onward motion. He accomplishes this improvement by screwing three tubes into the cast iron end piece of the tail of the rocket, in lines parallel to its longitudinal axis, at equal distances from each other, around a central aperture, from which tubes and central aperture the gas, when generated in the rocket, escapes freely and direct; and as these openings are all parallel with each other, and in the direction of the rocket's longitudinal axis, the whole force of the gas in its escape acts to impel the rocket forward. He produces a rapid rotation at the same time without the necessity of having tangential apertures or inclined planes for the gas to imfring on (as he required in his former patents for effecting rotation) by simply cutting away from each of the three tubes that project from the tail piece one-half of the side, for the purpose of allowing the gas, as it escapes in its compressed state, to expand on one side of each tube in a direction that makes a tangent to the circle in which the tubes are placed, while on the opposite side it is prevented from expanding by the half tubes that remain, thus producing an unbalanced pressure, which causes the rocket to rotate rapidly about its longitudinal axis; or, instead of screwing the tubes into the tail piece, the half tubes and the central apertures may be formed with the tail piece in one casting, which plan he very much prefers. *Patent completed.*

1221. W. FISKEN. *Improved apparatus for cultivating land by means of steam power.* Dated April 25, 1862.

This invention relates to the employment of two progressive combined anchor windlasses for hauling ploughs and other implements of tillage. An anchor and windlass are combined in one frame, and one of these combined anchor windlasses is placed at each end or side of the field to be cultivated in the line of the traverse of the plough, or other cultivating implements intended to be operated. A progressive motion is given to the anchor windlasses by means of the prime mover along the sides or ends of the field to be cultivated, and they are thus always kept in a line with the cultivating implement as the work progresses. The windlasses serve alternately to drag the plough or other implement from one side or end of the field to the other. The power of the engine is transmitted and applied to the working of the combined anchor windlasses by means of an endless rope, which first passes round a double grooved sheave on the engine, then round a similar double grooved sheave on each anchor windlass; and this endless rope is guided by bearing pulleys and a capstan which keep it clear of the ground, and impart to it a proper tension. *Patent completed.*

1222. L. MCLACHLAN. *Improvements in governing or regulating light used for taking photographic portraits and other photographic pictures, part of which improvements is also applicable to lighting picture galleries.* Dated April 25, 1862.

This invention consists, firstly, in a method of preventing the direct rays of the sun from falling upon the sitter or other object to be copied, and of modifying or directing the light as occasion may require. This part of the invention the patentee divides into two portions. In the first instance, he causes strips of wood, or other suitable material, to hang downward from the roof, at such a distance apart, and of such a depth as to shut out the direct rays of the sun. These strips, if desired, he hangs upon centres, so that they may be inclined to any angle. Or, in addition to the strips above mentioned, he places cross pieces within the spaces formed by such strips, which cross pieces may also be moved to any angle, so as to govern the light in the other direction. The second division of this part of the invention refers to the side light, in order to govern which he uses projecting slips extending sideways; but in this instance he does not use these by themselves, but in combination with partitions situated within the spaces between them. Another part of the invention relates to a method of preventing light from being reflected from the surface used as a back ground in taking photographic portraits; and, lastly, the invention consists in the application of the above mentioned method of regulating light to the lighting of picture galleries. *Patent completed.*

1223. E. A. L. NEGRETTI and J. W. ZAMBRA. *Improvements in the construction of mercurial minimum thermometers.* Dated April 25, 1862.

This invention consists, firstly, in the employment in minimum thermometers of a platinum plug such as the patentees described in the specification of their patent for "Improvements in the construction of maximum thermometers," dated March, 1852 (No. 14,002). This plug need not, however, be a fixture in any part of the tube, as described in that specification, but may be arranged to act as a kind of valve. Instead of being placed between the mercurial bulb and the indicating tube, as in the improved maximum thermometer above referred to, the plug in the maximum thermometer must be placed behind the bulb, and be so arranged that, when the mercury expands, the latter will either pass the plug, if it be a fixture, into an additional bulb or supplementary reservoir, as described in the specification of a patent dated Oct. 15, 1855 (No. 2306); or the mercury will push the plug forward, if it be adapted, to act as a loose valve; but, on a decrease of temperature, the piece or plug of platinum, if loose, will follow the mercury until it arrives at a contracted part of the bore; or, if the plug be fixed, the mercury will recede from the additional bulb or supplementary reservoir, and also from the connecting tube as far as the plug, and no further, unless force be applied to detach the mercury from the platinum. This part of the invention is based upon the affinity of mercury for platinum, as the platinum plug will allow the mercury behind it to glide past, but will hold on to and retain the column, and prevent it from being detached from the platinum until force be applied. The operation of this instrument will be as follows:—The instrument is set for observation by lowering the indicating tube until the end of the mercury reaches the platinum plug, and is there held by the affinity of the platinum for the mercury. The mercury in the indicating tube will then show the present temperature. Upon a decrease of temperature, the mercury will recede in the indicating tube, and will continue so to do until the minimum temperature is attained. Should any increase of temperature take place in the meantime, the mercury, instead of rising in the indicating tube, will pass or push forward the platinum plug, and will enter the supplementary reservoir; then, should another decrease of temperature take place, say below the minimum heretofore attained, the mercury will first recede in the supplementary reservoir, or bulb, until it reaches the platinum plug, which will hold it there, and thereby indicate the former minimum temperature. The mercury will, from its affinity for the platinum, recede no further therefrom, but will recede only in the indicating tube, and thereby indicate a further decrease of temperature. *Patent completed.*

1224. W. E. NEWTON. *Improvements in chimneys for lamps.* (A communication.) Dated April 25, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1225. D. C. LE SOUEF. *An Improvement in the manufacture of nails, bolts, rivets, screws, eyes, and split-keys or pins.* (A communication.) Dated April 26, 1862.

According to this invention the head of the nail, bolt, rivet, screw eye, split key, or pin, is made of porcelain, or any other kind of earthenware, and when partially dried a hole is partially made in such head to admit the shank or other part of the nail, bolt, rivet, screw eye, or split key or pin, which is further fixed to the head by means of a cement composed of quick lime, white of egg, and slack lime. *Patent abandoned.*

1226. T. E. BROCKLEHURST. *Improvements in machinery for reeling singles, trains, organzines, and sewing silks.* Dated April 26, 1862.

The object of this invention is to obtain an exact number of yards or metres in each skein of silk for dramming and sizing purposes. In performing the invention a rod, with handles running parallel with the reel, and within reach of the workman, is applied to the throwing or winding machine; to this rod is jointed a lever connected to the gearing, by which the reel is driven, by which arrangement, when a thread of silk breaks, the reel is instantly thrown out of gear with the driving power, thereby suddenly stopping the reel, and preventing any more threads being wound on until the broken end is pieced up. *Patent abandoned.*

1227. G. H. LAW. *Improved means for draining flower-pots and other articles or things which require draining in the same or a similar manner.* Dated April 26, 1862.

This invention consists in the use and adoption of a dome shaped, or of a basin-like or hollow conical, or conoidal, or pyramidal, or flat perforated piece of zinc, galvanized iron, tin, or other metal, earthenware, glass, or wood, gutta percha, or other material, provided with openings at the edges or other points thereof, which is to be placed over the hole at the bottom or at other point of the flower-pot or other article to be drained. *Patent abandoned.*

1228. J. G. N. ALLEYNE. *Improvements in machinery and apparatus for the preparation and manufacture of iron and steel.* Dated April 26, 1862.

The patentee claims, firstly, the arrangement of direct-acting steam hammers, wherein one vertical or nearly vertical steam hammer is combined with one or more horizontal or nearly horizontal steam hammers, to act either simultaneously or consecutively upon one and the same piece of metal, substantially as described. Secondly. The arrangement of rolling mills, wherein two or more engines or sets of engines are employed for imparting consecutively two or more different speeds in the same direction to the rolls, one of the said engines or sets of engines being put in gear with the rolling mill when a certain speed is required, and another of the said engines or sets of engines being put in gear with the rolling mill when another speed is required, substantially as described. Thirdly. The arrangement of rolling mills wherein two or more sets of reversing engines are employed, each set of reversing engines running at a different speed, and one set of the said reversing engines being connected to the rolling mill when a certain speed is required, and another set of the said reversing engines being connected to the rolling mill when a different speed is required, the first-named set of engines being then disconnected from the rolling mill, substantially as described. Fourthly. The arrangement of circular saws for trimming the metal after being rolled, wherein the saws and steam engines driving the same are mounted on moveable platforms, the engines being connected to the main steam pipe by a pair or more of trunnion jointed pipes, admitting of the platforms carrying the saws being moved within certain limits without its being requisite to disconnect and reconnect the said jointed pipes from and to the said main steam pipe, substantially as described. *Patent completed.*

1229. E. ALCAN. *An improvement in or addition to carding engines.* (A communication.) Dated April 26, 1862.

This invention consists in adding an endless web to carding engines, as explained with reference to the drawings. *Patent abandoned.*

1230. W. CLARK. *Improvements in collars, wrist bands, and cuffs.* (A communication.) Dated April 26, 1862.

In carrying out this invention, the patentee, firstly, takes strips or brands of cotton, linen, or other fabric, and pastes them on a foundation of strips of paper, or other material, for the purpose of obtaining the thickness and firmness of ordinary stitched collars, and afterwards slightly presses them. Secondly, He obtains a perfect imitation of the stitching, goffering, and other means of ornamenting collars by means of suitable pressure, or a screw or other press. Thirdly, The invention consists in a new method for replacing the button or fastening for securing the collar in its place, and connecting its two ends together as represented in the drawings. *Patent completed.*

1231. S. CHEAVIN and G. CHEAVIN. *Improvements in filtering and purifying water, and in apparatus employed therein.* Dated April 26, 1862.

On the 5th December, 1853, a patent (No. 2820), was granted to one of the present patentees, for "a double action or belt filter," and the construction of this filter was fully described in the specification of the said patent. The filter, as there described, has a bowl or vase at the top; this in practice is found difficult to construct. According to the present invention, the patentees do not employ this bowl, but in place thereof they carry up the body of the filter (which may be cylindrical or of other form) higher than before, and the upper part thereof they employ in place of the bowl, this portion being divided off by a partition, through which passes the small perforated cylinder employed as before to contain sponge or similar material. Around this small cylinder they pack the filtering or purifying material with which the water first comes in contact, and below this there is, as before, another bed of filtering material contained between two perforated plates, and for facility of renewing this material, as well as to facilitate the original construction of the filter, they make the central portion of the exterior vessel (where this filtering bed comes), separate from the upper and lower parts of the same vessel; the parts fit together with flanges, and are secured by screws or bolts. This arrangement allows of ready access to the filtering material. In order to clean the filter from time to time, when it is not necessary to change the filtering materials, they introduce a plunger or piston into the inner perforated cylinder, and work it up and down as a pump. To facilitate this they arrange the exterior vessel so that a lever like a pump handle may be connected with it by a pin or axis, and to this lever the rod of the piston or plunger is also jointed; this method of cleaning is more especially applicable to filters of large size. There is a passage made for the escape of the water employed in cleaning at a point over the filtering beds, as well as below, as is described in the said former specification. In filters or purifiers of large size, several of the inner perforated cylinders may be employed. For the purpose of filtering and purifying water in this and other apparatus, they employ coal, either prepared by washing it with acid, or otherwise. *Patent completed.*

1232. F. G. SPILSBURY, and F. W. EMERSON. *Improvements in the treatment of fusee oil, and for various applications of the same to useful purposes.* Dated April 26, 1862.

These improved processes for treating fusee oil, firstly, in mixing fusee oil with any hydro-carbon, such as petroleum, rock oil, kerosene oil, paraffine oils, turpentole, naptha, or the heavy remaining oils from the distillation of paraffine oils, or of naphtha, or of benzole from coal tar, turpentine, or other similar substances. The proportions vary according to the oils used from 10 per cent. to 100 per cent. of the oils to the fusee oil used. This mixture the inventors submit to distillation, and draw off as much as will come over under a heat of 500 deg. Fahrenheit. Secondly. They dissolve or mix resin, bitumen, coal, paraffine, or napthaline fat, tallow, or oil with fusee oil, and in the same way submit the mixture to distillation, drawing off as much of the oil as will come. Lastly, they pass fusee oil by itself, or any of the aforesaid mixtures, through a red hot tube, which splits the oil into propylic and other alcohols. With certain oils, all or any of these oils so produced, are burned in a paraffine oil or other appropriate lamp; or the inventors use them as solvents for gums and caoutchouc; or such as are without any unpleasant odour they employ as detergents. *Patent abandoned.*

1233. A. BOYLE and T. WARWICK. *New or improved machinery for manufacturing hair pins and cottar pins, a part of which machinery may also be used for cutting off and pointing wires for various purposes.* Dated April 26, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1234. H. W. HART. *Improvements in the manufacture of reflectors and shades for gas and other lights.* Dated April 26, 1862.

This invention relates to reflecting shades for gas and other lights, and consists in the application of a metallic surface to paper or cardboard, the metal forming the reflecting medium or surface, while the paper stuff forms the body of the shade. *Patent completed.*

1235. G. BISCHOF, JUN. *Treating solutions containing copper and silver, or either of them, to obtain metallic copper and silver.* Dated April 26, 1862.

This invention consists in the use of certain processes, by means of which the metals are obtained in the metallic state. For the purpose of obtaining copper from solutions containing this metal, the patentee, in the first place, obtains metallic iron in a finely divided form by reducing the oxide, or sulphuret, or a salt of iron, taking care to avoid fusion. The finely divided iron so obtained he introduces in suitable proportion into the solution containing copper, and in this manner he immediately obtains a precipitate of metallic copper, very much purer than the precipitated copper obtained by means of iron in other forms. *Patent completed.*

1236. G. H. SMITH. *Crinoline or elastic hoops for dresses.* Dated April 26, 1862.

This invention consists in a combination of steel, iron, or other wire with stout threads or cords composed of cotton, flax, or other fibrous substance. Two, three, or more of the wires are arranged longitudinally, at convenient or suitable distances apart, according to the intended width of the fabric to be produced, and between these wire warps are placed, in sufficient number, firm, strong cords of cotton, flax, hemp, or other suitable fibrous substances. All these are arranged in the form of a warp, and are woven into a fabric in the ordinary manner by means of a weft. If desired the wires may be covered with cotton or other fibrous substance, and when the combined fabric is completed it will be sufficiently elastic and much lighter than ordinary crinoline steel hoops. *Patent abandoned.*

1237. A. LESTER. *Manufacture of the fronts or uppers of slippers, shoes, boots, and gaiters, and of mats, bags, &c.* Dated April 26, 1862.

This invention consists in weaving the fabric, of which the intended article is to be made, of a pre-arranged pattern or design, depending upon and suitable to the form or shape of the article intended to be produced. For instance

for the front of the slipper, shoe, or boot, the pattern is to be expressly designed to suit the form of the article intended to be produced, and this pattern, having been drawn upon the ordinary draught paper, is read off, and the chain of cards prepared in the manner usually adopted in preparing looms for jacquard weaving. The fabric is then woven in the piece with the pattern thereon, in such a form that, when it is made up, the article will present the appearance of fine needlework produced by hand. *Patent completed.*

1238. A. V. NEWTON. *Hollow glass ware.* (A communication.) Dated April 26, 1862.

This invention applied to hollow pressed glass ware, also to hollow glass ware produced by blowing, and to glass ware made by a combination of the pressing and blowing processes. The nature of the first part of the invention consists in producing a solid wall to a hollow glass lamp bowl, a tumbler, and to other similar pieces of hollow glass ware, with ornaments formed in or on the glass composing the wall, at a point intermediate of or between the inner and outer plain surfaces of the wall, by a combination of a pressing and a blowing operation or process. The nature of the second part of the invention consists in the combination of the blowing and pressing processes, for the production of glass lamp-pegs and other similar articles, with ornaments on their inner or outer surfaces in a more expeditious and cheap manner than is at present known in the art of glass manufacture. The nature of the third part of the invention consists in a method of producing pressed open work figures, such as flowers, shelves, and leaves, net work, and geometrical figures in coloured glass, and uniting the same to various descriptions of glass ware, so as to stand in bas relief. This manufacture combines the pressing and blowing processes, or repuires but one or the other of them, according to the character of the article being made, or as the fancy of the operator may dictate. *Patent completed.*

1239. A. V. NEWTON. *Lamps for burning coal, oil, and other hydro-carbons.* (A communioation.) Dated April 26, 1862.

The metal wick tube of the burner of these lamps is surrounded by a tube of earthy cement, porcelain, pipe, and other clays, artificial or natural stone, pottery, earthenware, opaque glass, or other analogous materials which are good non-conductors of heat, and also using in connection therewith a cone or deflector, constructed either of the material above-named, or of metal enamelled and attached to the tube surrounding the wick tube, in such a manner as to isolate the cone from the external tube. By this means only a suitable proportion of the heat evolved by the flame is conducted down to the lamp, and the flame is consequently not supplied with an excess of vapour, but is provided with a supply of oxygen amply proportionate to the vapour without a draught chimney. *Patent abandoned.*

PROVISIONAL PROTECTIONS.

Dated July 7, 1862.

1958. J. McGeary, Bayham-terrace. Improvements in the manufacture of gas, and the apparatus to be employed for that purpose. (Partly a communication.)

Dated August 23, 1862.

2355. F. T. Moison, chemist, 13, Rue Gaillon, Paris. Improvements in the process of cleaning organic matter.

Dated August 30, 1862.

2409. W. E. Gedge, 11, Wellington-street, Strand. Improvements in machinery or apparatus for manufacturing velvet. (A communication.)

Dated September 26, 1862.

2629. W. E. Gedge, 11, Wellington-street, Strand. Improvements in the construction of leaden window sashes, casements, or glazed coverings or partitions. (A communication.)

Dated October 9, 1862.

2725. J. H. Johnson, 47, Lincoln's-inn-fields, gentleman. Improvements in polishing precious and other hard stones, and in the machinery or apparatus employed therein. (A communication.)

Dated October 13, 1862.

2757. W. G. Haig, Canonbury Park North, gentleman. A new article of apparel to be worn instead of, or in addition to, a shirt front and waistcoat.

Dated October 14, 1862.

2766. J. Snider, jun., 51, Dorset-street. Improvements in the construction of "Hansom cabs," and other similar vehicles.

Dated October 27, 1862.

2888. W. J. Williams, 51, Dorset-street, Salisbury-square. Improvements in the construction of field rakes for agricultural purposes. (Partly a communication.)

Dated October 28, 1862.

2902. G. H. Smith, North Perrott, Somerset, twine and web manufacturer. Improvements in the manufacture of crinoline or elastic hoops for dresses.

Dated October 29, 1862.

2910. A. Krupp, Essen, Prussia, cast steel manufacturer. Certain improvements in breech loading ordnance and fire-arms.

Dated October 30, 1862.

2928. G. Mayall, jun., Liverpool, broker, and J. Hollingworth, Micklehurst, Chester, manager. Certain improvements in machinery or apparatus for preparing cotton and other fibrous materials for spinning.

2930. G. Piggott, Birmingham, manufacturer. New or improved machinery for punching, shearing, and rivetting sheets or plates of iron and other metals and alloys.

2932. J. Horton, Etna Works, Smethwick, near Birmingham, Stafford. Improvements in the construction of armour plated ships and fortifications.

2934. A. Guild, Horbury-gardens, Notting-hill, merchant. Improved apparatus for preparing and treating the leaves and stalks of fibre-yielding plants, and for cleaning and dressing the same.

Dated October 31, 1862.

2936. W. Astrop, Jubilee-street, Stepney, stationer. Improvements in the manufacture of paper.

2940. D. Spink, esquire, Spaxton, near Bridgewater, Somerset. Improvements in the method of propelling ships and other vessels.

2942. C. Gubbins, esquire, York-place, Portman-square. Improvements in irons for ironing.

2944. H. Thomson, Buckden, Huntingdon, engineer. Improvements in railway signals.

2946. G. Speight, 5, St. John-street-road, Clerkenwell, manufacturer. An improvement in the manufacture of collars for men's wear.

2952. W. Jenkins, Troedy Rhiw, Merthyr Tydvil, Glamorgan, viewer. An improved mode of and apparatus for cutting coal.

Dated November 1, 1862.

2958. E. Stevens, 15, Hunter-street, Brunswick-square. Improvements in iron shelves, stands, and racks.

2960. E. Hopkins, Clarendon-gardens, Maida-hill, civil engineer. An improved mode of and apparatus for treating ores for the extraction of metals therefrom.

Dated November 3, 1862.

2964. C. Shield, Newcastle-upon-Tyne, engineer. Improvements in the manufacture of malleable cast iron.

2968. E. Humphrys, Deptford. Improvements in the construction of centrifugal pumps.

2970. T. O. Clark, Clapham-common, upholsterer. An improved portable spring bottom bedstead. (A communication).

2974. W. H. Stallard, Mark-lane, merchant. Improvements in umbrellas and parasols.

Dated November 4, 1862.

2978. J. McKean, Walmer-bridge Mills, near Preston, manufacturer, and T. Greenhall, Manchester, flour factor. Improvements in sizing or dressing yarns or textile materials.

2980. T. Logan, Kensington, gentleman. An improved kaleidoscope.

2986. J. E. F. Lüdeke, Marke, Hanover. Improvements in magneto-electric apparatus for obtaining and applying motive power.

2988. A. Wall, Canton-street, East India-road, Poplar. Improved processes for purifying lead, and extracting and separating silver therefrom, and in machinery for those purposes.

Dated November 5, 1862.

2990. S. Robotham, Birmingham, wire weaver. Improvements in carriage bodies.

2992. W. Johnson, 166, Buchanan-street, Glasgow, civil engineer. Improvements in the arrangement and construction of pillars or standards for supporting telegraph wires. (A communication.)

2994. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in taps or cocks. (A communication.)

2996. C. Shield, Newcastle-upon-Tyne, engineer. Improvements in the manufacture of malleable cast-iron.

2998. J. Petrie, jun., Rochdale, ironmonger, and J. Teal, Sowerby, York, mechanic. Improvements in machinery or apparatus for washing wool and other fibrous materials.

3000. D. Hill, 3, Camden-road, Holloway. Improvements in apparatus for stamping or marking and counting bank notes and other documents.

3002. T. Brown, 85, Wood-street, Cheapside. Improvements in machinery for surfacing fibrous materials. (A communication.)

Dated November 6, 1862.

3004. W. E. Gedge, 11, Wellington-street, Strand. An improved lift and force pump. (A communication.)

3006. H. Griffin, Silvertown, Essex, engineer. An improved method of securing india-rubber cylinders or rollers and blocks upon spindles and other bodies on which they are to be mounted.

3008. J. A. Fullarton, Manchester, iron merchant. Improvements in machinery or apparatus for painting or coating hoop iron and other strips, bars, rods, or other such articles of metal, wood, or other material.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

1942. T. O. Dixon. Heating or warming rooms or buildings.

1957. T. Edwards. Indices for gas, water, and other fluid meters.

1958. J. McGeary. Manufacture of gas. (Partly a communication.)

1962. C. B. Gruner. Photographic apparatus.

1966. J. Rigby. Breech-loading guns.

1969. H. Wethered. Construction of handles, latches, or fastenings for doors, gates, and windows.

1973. A. Gilbey. Washing and cleansing bottles.

1974. H. S. Pontifex. Distributing water applicable to cleansing casks or other vessels, or for other purposes.

1977. H. Eschwege. Purifying wood and other vinegar.

1986. J. Mander. Crochet needles and crotchet needle holders.

1991. J. Leeming. Jacquard or index machines.

1994. J. H. Johnson. Braiding machines. (A communication.)

2000. J. Miller. Steering ships and other vessels.

2014. Hon. W. E. Cochrane. Railway fastenings.

2016. G. Lowry. Machinery for carding and cleaning fibrous materials.

2023. P. A. L. Canonicat. Filtering water.

2024. G. Faweus. Building boats.

2026. O. P. Drake. Vaporizing and aerating a liquid hydrocarbon.

2027. R. Ridley, and J. G. Jones. Ventilating mines and other places.

2028. A. Leslie. Applying steam or other motive power to cultivate the soil and to actuate wheeled carriages.

2035. T. G. Ghislin. Treatment or preparation of British and foreign algæ, and the application of the same to various branches of the arts and manufactures.

2048. T. B. Daft. Manufacture of mats.

2049. T. B. Daft. Manufacture of vulcanized india-rubber thread.

2061. R. A. Brooman. Revivifying animal black. (A communication.)

2064. W. E. Newton. Ordnance. (A communication.)

2096. A. Vignon. Apparatus for extinguishing fires. (Partly a communication.)

2108. W. Clark. Manufacture of fishing and other nets. (A communication.)

2165. W. Clark. Gas burners. (A communication.)

2168. J. W. Dixon, jun. Coffee urns.

2169. J. W. Woodford. Raising or forcing water.

2209. M. A. F. Mennons. Self-inking hand stamp. (A communicarion.)

2249. A. J. Martin, J. Gooss, and J. Bush. Apparatus for distillation.

2261. A. B. Childs. Machinery for cutting veneers. (A communication.)

2386. E. Astel. Urinary utensils.

2612. M. A. F. Mennons. Chair settees. (A communication.)

2785. F. F. Prud'homme. Raising water.

2823. W. A. Turner, and T. T. Coughin. Measuring fabrics.

2898. E. Hooper. Roofing tiles.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'

LIST OF SEALED PATENTS.

Sealed November 11, 1862.

1415. H. Walker.	1528. W. Petrie.
1498. R. Davison, and T. Johnson.	1540. C. W. Siemens.
1508. J. Wright.	1545. S. and F. Turnbull.
1515. T. M. B. Weare, and E. H. C. Monckton.	1557. W. E. Wiley.
1516. T. M. R. Weare, and E. H. C. Monckton.	1573. W. Worby.
1521. W. Naylor.	1609. J. A. Ransome.
1523. J. Taylor.	1691. E. Conroy.
1525. E. Fewtrell.	1701. E. Conroy.
	1702. G. Hadfield.
	1810. M. Wigzell.
	2426. W. Hunt.

Sealed November 18, 1862.

1533. M. A. Le B. Virloy.	1576. G. A. Huddart.
1534. W. Bush.	1588. F. Tolhausen.
1542. E. de La Bastida.	1608. W. Blackmore.
1544. J. Needham.	1636. J. Ives.
1550. H. Cook.	1934. J. Webster.
1558. J. Webster.	1940. W. M. Williams.
1560. E. Mouline.	2445. B. F. Cowan.
1562. A. Samuelson.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2570. A. Vickers.	2586. E. Borlase.
2595. J. Graham.	2603. J. Ward, and H. Burman.
2615. S. Corbett.	2619. E. Barlow, and F. Hamilton.
2623. G. Godchaux.	2620, J. McKenzie, and S. T. Wentworth.
2635. G. W. Lenox.	
2578. J. Walworth, and R. Harrowby.	
2585. W. H. Ward.	

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2581. G. T. Bousfield.	2768. H. Bessemer.
2597. G. Collier, and J. W. Crossley.	2602. W. Smith.
	2612. A. V. Newton.

LIST OF SPECIFICATIONS PUBLISHED

For the Week ending November 8, 1862.

No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.	No.	Pr.
	s. d.		s. d.		s. d.		s. d.		s. d.		s. d.
932	0 8	948	0 6	964	0 6	980	0 4	996	0 4	1011	1 6
933	0 10	949	0 8	965	0 4	981	0 4	997	0 4	1012	0 6
934	0 8	950	0 8	966	1 6	982	0 10	998	0 4	1013	1 4
935	1 2	951	0 10	967	0 8	983	0 8	999	0 6	1014	0 8
936	0 4	952	1 4	968	0 4	984	0 8	1000	0 10	1015	0 4
937	0 6	953	0 4	969	0 4	985	0 8	1001	1 4	1016	0 10
938	0 8	954	0 4	970	0 4	986	0 4	1002	0 4	1017	0 8
939	1 6	955	1 8	971	0 4	987	0 10	1003	0 6	1018	0 4
940	0 10	956	0 8	972	0 8	988	0 8	1004	0 4	1019	1 2
941	1 4	957	0 8	973	0 4	989	0 4	1005	0 4	1020	0 10
942	1 4	958	0 4	974	0 8	990	0 4	1006	0 4	1021	0 4
943	0 4	959	1 4	975	0 10	991	0 4	1007	1 4	1022	0 4
944	0 6	960	0 4	976	1 0	992	0 4	1008	1 2	1023	0 10
945	0 4	961	0 6	977	0 4	993	0 6	1009	0 8	1024	0 10
946	3 10	962	0 4	978	0 4	994	1 2	1010	0 10	1025	0 4
947	0 4	963	0 6	979	0 8	995	0 4				

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, NOVEMBER 28, 1862.

THE PROGRESS OF THE MODERN MANUFACTURING SYSTEM.

THE above is the main title of a remarkable paper lately published by the well known political economist of France, M. Michel Chevalier. It forms the introduction to the general report on the International Exhibition of 1862, compiled from the 99 special reports of the 130 French jurors. This special commission, chosen by the Emperor himself, has worked under the presidency of Prince Napoleon. International Exhibitions promise to become an international institution, enabling the nations to "take stock" of each other's progress. The remarkable man at present at the head of France seems to have spared no means of enabling his people to read aright the great lessons offered at the late World's show. These French reports promise to be its only systematic record.

It may not be uninteresting to notice what a chosen body of French *savants* and manufacturers, our rivals and opponents in so many things, have thought about our Exhibition. We may with justice call it ours, for although nominally an international affair, still the greater part of the things present were more or less English. The eastern annex, for instance, was an entirely English exhibition, and France and Germany made, from various reasons, but a comparatively small appearance in the western annex. We allude more particularly to these two parts of the Exhibition, as they fall more specially within the province of the MECHANICS' MAGAZINE.

The tone of the whole essay is very cordial towards England, and it also expresses much satisfaction at the results of the Exhibition. There are some eloquent pages about the civilizing influence of the engineer, and of the science of mechanics. Volumes might, no doubt, be written on this subject.

M. Chevalier considers the following great truth is to be evolved from a consideration of the great Exhibitions of 1851, 1855, and 1862, namely, that the producing powers of mankind are continually on the increase, and that this increase is only of comparatively recent origin. What he understands by producing or manufacturing power is the work that one man can do in any given time. For instance, supposing that a rolling mill, with 100 workmen, delivers 10,000 tons of iron in a year, the manufacturing power of each man will be 100 tons per annum. He gives the following interesting instances of this progressive progress of manufacturing power:—Twelve years ago the Californian miners used to get at the gold by simply washing the alluvial soil in tin pans. This plan is the same used by the ancient Egyptians, as still shown on their old monuments. Many people will have seen a man in a red shirt, washing gold in the Exhibition, upon this plan. These Californian deposits of gold, in course of time, got to be very poor, and would no longer pay hand labour. By using machinery, however, the Californian miners can work a digging with considerable profit, even when the soil contains only 1 lb. of gold to 4,000,000 lbs. of alluvium. The price of a day's labour in California is 20f., and the expense of washing by hand labour a cubic metre of earth is 75f. This expense has been] reduced to 3 centimes a cubic metre. This represents, therefore, a manufacturing progression of 1 to 2,500.

In the manufacture of iron, M. Chevalier considers that this productive power has increased thirty times, dating 600 years back. Dating from the year 1769, when Arkwright took out his first patent, one man can now spin 400 times more thread than the best spinner of that period. The year 1769 is certainly an extraordinary one in history. Napoleon the First, Wellington, Mehemet Ali, Castlereagh, Humboldt, Cuvier, and M. T. Brunel, were all born in the same year that saw the beginning of cotton spinning. The present method of grinding flour, compared with the clumsy and painful method of ancient times, shows a gain in the productive power of one man of about 150 times. In the manufacture of lace, one workwoman can now do the work of one hundred without the machine.

In the manufacture of sugar the small crystals mixed with syrup are now placed in a centrifugal machine making about 1,400 revolutions per minute. The liquid is driven off by the centrifugal force, while the sugar remains, and it only requires to be dried in a stove. The whole operation of refining now lasts only as many days as it formerly used to last months. Looking-glasses were formerly made by using an amalgam of mercury and tin. Silver, as first proposed by Liebig, is now used instead of the mercury. The process of fixing the amalgam used to last six weeks for a large glass. The present process lasts only 40 minutes; the silver adheres much better than the tin amalgam, and, above all, the manufacture is not unwholesome for the workmen. Unfortunately, this increase of manufacturing power is not confined to peaceful purposes. An iron-plated ship has engines of, say, 1,400 nominal horse power. The real horse power of this is about five times the nominal, namely 7,000-horse. As a steam horse power is twice as much as a flesh and blood horse power, and as the engine can work 24 hours, while the cart-horse can only work 8 hours, a steam horse power can, therefore, do as much as 6 common horses. This steam apparatus is, therefore, as much as 42,000 flesh and blood horses. With the exception of the horses belonging to the great army Napoleon the First led to Moscow, there probably never has been such a number of flesh and blood horses together.

In alluding more especially to advances made since 1851, M. Chevalier states that, in 1848, there were only 1,821 kilometres of line of railway in France. There are 10,500 kilometres at present, and an almost equal length in course of construction. Forty years ago, in Paris, a 50-horse beam engine cost, complete, with boiler, &c., rather more than 100,000f. A horizontal engine of the same power costs now rather less than 50,000f. The demand for portable engines (locomobiles) has everywhere largely increased, particularly in France, since 1855. M. Chevalier gives the honour of the invention of the steam hammer to M. Bourdon, formerly of Creuzot. The belief that M. Bourdon is the inventor of this tool seems to be general on the Continent. It is a pity that the stupidity of the then partners of Mr. Nasmyth allowed the honour of making the first steam hammer to be wrested from our country. It is curious to observe how each nationality puts forth its own special claims to almost every great invention. There is a separate inventor of the screw propeller for England, France, and Germany. Germany and Holland both claim the invention of printing. England and Germany both claim the discovery of gunpowder. France claims even the steam engine for Solomon de Caus and Denis Papeir. We might give many more instances of this. Somehow or other, however, we English have first practically applied all these things. It was at Crecy that cannon was first used. We first had a free press, and the first real steam engine in France was imported from England.

M. Chevalier recalls that, in 1851, Krupp sent a small cast-steel cannon to the then Exhibition. At the Paris Exhibition of 1855, he had an ingot of steel of 5½ tons. He has greatly surpassed these by his 1862 exhibit, his large cranked axle of cast-steel weighing no less than 20 tons. We ourselves have no doubt that, sooner or later, every detail of an engine will be made of steel. In alluding to the Bessemer process, M. Chevalier remarks that it is a discovery of greater importance than all the gold mines of California and Australia.

He also lays great stress on the fact of our Great Northern Railway, replacing the worn-out iron rails by similar ones of steel, with the expectation that these latter will last three times as long. There are some interesting observations about aluminium. It is stated that when M. Sainte-Claire Deville first made it, its price was 3,000f. the kilogramme. It now costs only 80f., and it would be even less if a large demand should take place. As is well known, a common brick is mainly composed of alumina, the oxyde of this metal. According to M. Chevalier, a very strong piece of ordnance has been made in France of aluminium bronze. It has also been employed for the bearings of shafts, with very good results. Without professing to have an intimate practical acquaintance with this substance, we do not believe that it will ever take rank as a very valuable metal. It is very light, and the power of any metal to resist decomposition while in contact with oxygen is generally in a direct ratio to its density. As an alloy with other metals it may prove very valuable. It appears that the French jurors have been very much struck by the progress, since 1851, in artistic taste of the English art manufactures. This has been especially the case as regards the design and colouring of woven materials, and the shapes of furniture work. This is consolatory to those English people who think we have not advanced in this direction. Good artistic taste is more particularly the forte of the French manufactures in general. It is curious that the shapes of their machinery at Kensington showed such a great want of symmetry.

It would appear that our laws, or rather the absence of laws, bearing upon manufactures, have been investigated by the order of the Emperor with a view to reform similar French legislative enactments. In France permission must be asked of the Government to build a blast furnace, or even a refining furnace. Complaint is also made by M. Chevalier that the laws about steam-boilers are oppressive and absurd. They prescribe such a testing pressure that the boiler is thereby injured, and such a great thickness of plate that it is impossible to use steel or plate of the best kind. This is a useful lesson to those well-meaning people who wish to trammel the English boiler-makers. What is required in England is simply the extension to all parts of the useful boiler insurance societies, which first arose some six or seven years ago in Manchester.

As is well known, the whole net of French railways has been traced out by the Government. It is, no doubt, very well arranged; but, from there being no competition, the companies work the trains at a very slow speed. A Manchester manufacturer, on sending off his bales in the evening, can deliver

them to the buyer in London the next morning at 10 or 11 a.m. M. Chevalier states that, under the present French railway management, this would take seven days. He mentions that he has known several cases in which goods have regularly taken one whole month to be conveyed from the north to the south of France. In England, competition induces high speed, but the lines do not pay, and accidents seem to be more frequent. Both these opposite systems seem to cause dissatisfaction. The French Government, having laid out and guaranteed the railway lines, is now called upon to regulate the speeds of the trains. Once a Government begins to interfere in matters of this kind, it is for ever after bound to keep up this superintendence. Any spontaneous action is thus rendered impossible.

A reform of the patent laws seems to be as much wanted in France as with us. M. Chevalier seems to take the same view about patents as the *Times* and Sir William Armstrong. Let us hope that the new patent law to be carried next session will enlighten him on this subject. The agitation against the patent law seems to be raised by the large French manufacturers in the same way as with us. No doubt they understand as well as their English brethren that, without the protection of a good patent law, there will be no invention or alteration, and therefore less depreciation of old patterns already in stock. At the same time, the French manufacturers have to undergo peculiar hardships in some cases. The neighbouring countries of Prussia and Switzerland do not recognise any patent law. A new article can thus be manufactured in these countries without any royalty having to be paid. The result is that the maker, obliged to pay a royalty—is driven out of many markets.

The same thing happens with us. As soon as the Prussian makers hear, for instance, of any new agricultural implement, they come over and buy the machine. They then copy it, and are able to make it, free of royalty, for the whole North of Germany. Such a state of things is a disgrace, and the system is simply an organised robbery. It does great harm to Prussia itself. Instead of designing, the manufacturers of that country merely copy. They are less advanced in many manufactures than they otherwise would be. Patentees are teachers and reformers of manufacturing industry. They are frequently the missionaries of science, and they form a continual propaganda of industrial progress.

In this short notice we have given but a faint idea of this very interesting and suggestive essay. M. Michel Chevalier remarks at the conclusion that this great meeting of the industry of all nations has been for all mankind what the Olympic games were to the Greeks. It has been a meeting of the great family of nations where, at least for a short time, national hatreds and prejudices have been laid on one side. Let us hope, therefore, that the ordnance exhibits will be articles the least in demand.

TT.

STEAM FIRE-ENGINES.

Steam fire-engines, like almost everything else good in this country, have had to fight an uphill battle. Thirty years ago Mr. Braithwaite demonstrated their utility, and, we may say, their superiority; but so many objections were raised against them, that that gentleman was induced, after years of effort, to abandon the struggle in favour of their adoption. Had he been encouraged instead of being discouraged, the probability is that the metropolis would have been better able to subdue great fires than it is at the present moment. Whilst, however, objections were urged, and official authority exerted, to prevent the use of steam fire-engines amongst ourselves, the Americans were on the alert to improve on the engine patented and produced by Mr. Braithwaite. Steam fire-engines have accordingly been extensively used for years past in New York, Philadelphia, and other American cities. The successful employment of these engines in America, and the absolute necessity for something more powerful than our ordinary fire-engines, to cope with occasional gigantic metropolitan conflagrations, have broken through prejudices, stimulated inventors and manufacturers, and steam fire-engines are in demand. Why should they not? Certainly if they are good for American cities they are equally good for London. When a fire breaks out the sooner it is quenched the better. And as steamers can be moved as rapidly, managed as easily, and be made to throw four or five times as much water as land engines, the sooner they are adopted in the metropolis the better. They can, no doubt, be worked cheaper. A half-a-hundred of coals will do more service than forty men. Besides, if steamers were more generally used, there would be fewer inducements for incendiary acts. It would be better if all rewards in connection with the discovery of fires, and for the first engine which gets at the fire, were immediately and for ever abolished. The policeman who first discovers a fire has, we believe, a reward of £2, and the engine which first gets at a fire has £5. Our criminal records too abundantly testify that men will occasionally commit crime with the expectation of getting small rewards. Not long since a police-officer, in one of the metropolitan divisions which we could name, was the first to discover no less than three fires in a very short space of time. This created suspicion, and means were used to discover the causes of the fires. The police-officer no sooner heard of the inquiries which were set on foot, than he fled. Other facts, equally full of suspicion, have, from time to time, come to our knowledge. Some years since, in one of the eastern counties, a man who had discovered no less than 11 burning ricks was arrested on suspicion. He afterwards confessed that he set fire to the ricks for the purpose of getting the paltry reward, in each case, of 1s. for being the first to give an alarm of the fire. We hope, therefore, that the proper authorities will, before long, see the propriety of abolishing all rewards.

On Monday last there was a competition trial of steam fire-engines at Messrs. Hodges's Distillery, Lambeth. Messrs. Shand and Mason and Mr. Roberts, of Millwall, did not on this occasion compete. The first fire-engine tried was the one recently manufactured by Messrs. Merryweather, and which was described and illustrated in the Mechanics' Magazine, May 2, 1862. The working of this engine excited some amount of curiosity on account of its working without a fly-wheel, thus securing a uniform speed of piston. The other steam fire-engine tried was manufactured by Messrs. Easton and Amos, on Mr. Wellington Lee's American patent, which also works without a fly-wheel. The advantage of this engine over others is said to consist in its arrangement as a duplex engine, with two double-acting pumps, the piston-rod of one cylinder creating a lever, which turns the steam on to the second cylinder.

The following are the results of the trials of the two steamers:—

Merryweather's steam fire-engine "Deluge" lighted fire at two o'clock.

	min.	sec.	
In	7	30	steam gauge moved.
,,	8	30	steam gauge showed 10 lbs.
,,	8	50	... ... 15 lbs.
,,	0	30	... ... 20 lbs.
,,	9	50	... ... 50 lbs.

At this point the engine started.

Lee's steam fire-engine, E size, lighted fire at 3 h. $22\frac{1}{2}$ min.

	min.	sec.	
In	6	15	steam gauge moved.
,,	7	30	steam gauge showed 10 lbs.
,,	8	0	... ... 20 lbs.
,,	9	0	the engine started.
,,	10	15	steam gauge showed 30 lbs.
,,	10	55	... ... 40 lbs.
,,	11	30	... ... 50 lbs.

The size jets used by Merryweather's engine were $1\frac{1}{4}$ in., $1\frac{3}{8}$ in., and $1\frac{1}{2}$ in. respectively. Those used by Lee's engine were $1\frac{1}{4}$ in., $1\frac{1}{2}$ in., and $1\frac{3}{8}$ in. diameter.

Although the state of the wind was very unfavourable to lofty throwing, both engines were played against a chimney 140 ft. high, and both threw a jet of water about 160 ft. high; and, as a final trial, each was connected to a long length of leather hose led to the top of the fire observatory, 135 ft. in height. A branch and nozzle being attached to the end, and a jet played both horizontally and vertically with good effect. In this experiment Lee's engine, after running for some time, raised the pressure in the air vessel to an extent sufficient to burst the conducting hose about half way up the mast.

As regards the mode of raising steam, two different plans were pursued. In Merryweather's engine a jet of steam was thrown into the chimney as soon as there was sufficient pressure to do so, for the purpose of creating a draft through the fire. In Lee's, there was no artificial jet of this kind, but as soon as possible the engine was started, and by this means a blast in the chimney created.

While under trial, Lee's engine was worked without a spark-catcher, although there is the means of attaching one when required. In the absence of this spark-catcher, burning cinders were sent from the funnel at a considerable height, and in great profusion. In throwing to great altitudes, the power required increases in a very much higher ratio than the height attained by the jet; hence this increase of power can only be attained by an increased production of steam, and a powerful blast becomes requisite.

In locomotive engines, where the same conditions apply in the case of high speeds, spark-catchers, variable blast nozzles, and other contrivances, have been adopted, and it is probable that in heavy work similar appliances would have to be adopted in the case of steam fire-engines.

The experiments gave great satisfaction to a very large number of visitors. Merryweather's was the first fire-engine manufactured by that firm, and it did its purposed work very ably. The latest experiment of the day was with a second and smaller steam-engine, built by Mr. Merryweather, which when completed will weigh only 30 cwt., and can be drawn with ease by one horse or three or four men. The object in this case was to discover in how short a time steam could be got up, and the result proved that in eight minutes 37 lb to the square inch was generated, and 100 lb. in $9\frac{1}{4}$ minutes. This is said to be the fastest generator of steam on record.

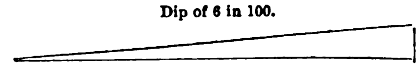
The committee of the proposed Moffatt Railway have given the Parliamentary notices, and Mr. Miller, the engineer, has been over the line with his assistants completing the plans for deposit in the end of this month.

THE ATLANTIC TELEGRAPH.

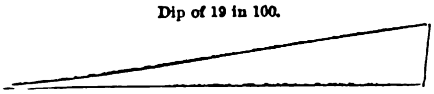
The following communication has been forwarded to the Atlantic Telegraph Company by Mr. Hoskyn, R.N., the gentleman who has recently surveyed portions of the western coast of Ireland for the company, by order of the Lords of the Admiralty, with a view to improve the line along which the intended cable to Newfoundland is to be taken:—

"Dear Sir,—With reference to the conversation I had with you recently in Dublin on the subjects connected with my Deep Sea Sounding cruise in the 'Porcupine,' I think that there can be no reasonable doubt now but that the descent from the Irish bank to the bed of the ocean is all that we can desire for he safe laying of the cable. So far from its being a precipice, a locomotive might run up some of the inclines, and many turnpike roads have steeper ascents, as the following diagrams more clearly illustrate, a dip of 6 ft. in 100 being the least, and 19 ft. in 100 the greatest we met with:—

Dip of 6 in 100.



Dip of 19 in 100.



"The face of this slope—and indeed the bed of the ocean everywhere when below the depth of 500 or 600 fathoms—is covered with the soft clayey substance called by seamen 'ouze.' This deposit, in the opinion of Professor King and other naturalists, is going on so copiously and unceasingly, that a cable once laid would, in the course of a few years, be 'covered up,' and so for ever sealed against the action of all external agencies.

"The question, then, is, what kind of cable will be best adapted to these conditions of the bed of the ocean, and, at the same time, the cheapest and easiest laid across the Atlantic from Ireland to Newfoundland. And here I am sure that all seamen and practical men will agree with me that the lighter it is the better, so that it has but specific gravity enough to sink it. Much stress was formerly laid on the strain it would be subjected to from counter-currents, but our larger experience has taught us that these, like the precipice, are imaginary dangers, and that, in the part of the ocean the cable will cross, there are even no surface currents that will injuriously affect it—these appearing to be more of a surface drift, whose direction and strength depends on the prevailing wind.

"That the cable should hold together during its descent through the still waters of the ocean does not require any great strength, probably the copper core alone would give it sufficient; but if, as we are told, a cable with a core of 5 cwt. of copper to the mile, coated with gutta percha, will have a breaking strain of 7 cwt., it surely is all that is necessary for its safe descent to the bottom.

"A cod line, with a 90 lb. weight attached for a sinker, occupies about 42 minutes in descending to a depth of 2,000 fathoms; and with a line of this description, made by Messrs. Newall, we have recovered a 64 lb. sinker from a depth of 1,750 ft.; this will probably give some idea of the opposing force the cable will meet in its descent to the bottom.

"If not required for strength, of what use, then, is the iron wire? It will not prevent the attacks of minute animals, for in laying out it is always more or less strained and opened, and moreover these have never been found to attack gutta percha. Supposing the bottom of the ocean to be free from volcanic action, as it certainly appears to be between Ireland and Newfoundland, I know of no other force that would be likely to injure the cable. Careful soundings at intervals of 5 or 6 miles would teach us if any such danger existed, and how to avoid it. I think, therefore, that the lightest cable that can be made would be the one most likely to solve this problem successfully. The shore ends, and where it crosses shoal water must, of course, be protected. The comparatively small cost of such a cable, and the ease with which it may be run out, makes it worth a trial; if one should succeed, of which I have no doubt, we might soon have duplicates and triplicates.

I remain, &c.,
R. Hoskyn, Master R.N.,
Late Commanding "Porcupine."

"Holywood, Belfast, Nov. 12, 1862."

The following letter has also been addressed to the Atlantic Telegraph Company respecting a future cable:—

"My Dear Sir,—Referring to our conversation this morning upon telegraph cables, I subjoin a few facts that will doubtless interest you.

"The manufacture of gutta percha since 1857 has been greatly improved, and its insulating power increased thereby more than ten times.

"The Dunwich Zandvoort cable, made in 1858, and 134 statute miles in length, contains four conducting wires of 110 lb. to the statute mile; two of them are insulated with two coatings of gutta percha only. The other two are insulated also with two coatings of gutta percha, but between the wire and the first coat of gutta percha, and between the two layers of that material, there is a film of Chatterton's compound (a mixture of vegetable tars and gutta percha).

"The Lowestoft and Zandvoort cable, made in 1862, contains four conducting wires of similar dimensions to those in the Dunwich cable, but each wire is insulated with three coats of gutta percha, and between each of those coats there is a film of Chatterton's compound.

The wires tested in August last in the following ratio (nearly):—

1858 cable.	2 wires plain gutta percha alone...	1
	2 wires „ with compound	1½
1862 cable.	All four	11

"The insulation having improved in the ratio of 1 to 11.

"The 1858 (Dunwich Zandvoort) cable improved in insulating power considerably after submersion a few months, and although submerged four years, its insulation is now as high as it ever was.

"The conducting power of copper has likewise been considerably improved.

"The conducting power of the 1862 cable is 25 per cent. greater than the 1858 cable; this improved conducting power increases the speed of the cable in a corresponding ratio.

"The appliances for testing cables during manufacture and otherwise have very considerably advanced; and minute leakages, that in 1858 would have escaped notice, are now easily detected.

"The speed of a cable is dependent upon the conducting power of the copper, its dimensions, and upon the insulating material.

"The speed of a cable of any length can be indefinately increased by augmenting the dimensions of the conductor and of the insulating material.

"The cost of working a cable accross the Atlantic with a large core, whose speed is 12 words per minute, will be no greater than that of working a smaller core of only 1 or 2 words per minute.

"The larger core giving 12 words per minute, will cost but little more for the external covering and submersion than the smaller core giving but 1 or 2 words per minute. £350,000 will make and lay a cable across the Atlantic, with a conductor weighing 93lbs. to the mile. £700,000 will make and lay a cable with a conductor of 560lbs. to the mile. Hence there would be a manifest economy in using a cable whose speed of transmission is pretty rapid.

"To go beyond the speed of 12 words a minute, would not be attended with a corresponding economy, because the operators cannot work with so much efficiency at higher speeds.

"The Atlantic Telegraph Company would have but two stations, in a distance of nearly 2,000 miles, and could, consequently, afford to pay such a price as would secure the services of the most skilled operators to be found, together with the most improved instrument which science can produce. Two very important items in the commercial success of the undertaking.

"I am, &c.,
C. F. Varley,
"Electrician to the Electric and International Telegraph Company, and to the Atlantic Telegraph Company."

THE MANCHESTER ASSOCIATION FOR THE PREVENTION OF STEAM BOILER EXPLOSIONS.

Chief Engineer's Monthly Report.

At the last ordinary monthly meeting of the executive committee of this association, held at the offices, 41, Corporation-street, Manchester, on Tuesday, Nov. 25, 1862, William Fairbairn, Esq., C.E., F.R.S., in the chair, Mr. L. E. Fletcher, chief engineer, presented his monthly report, of which the following is an abstract:—

"During the past month there have been examined 365 engines and 547 boilers. Of the latter 8 have been examined internally, 60 thoroughly, and 479 externally, in which the following defects have been found:—Fracture, 5 (1 dangerous); corrosion, 38 (3 dangerous); safety-valves out of order, 13; water gauges ditto, 31; pressure gauges ditto, 9; feed apparatus ditto, 6; blow-off cocks ditto, 47 (1 dangerous); fusible plugs ditto, 3; furnaces out of shape, 6 (2 dangerous); blistered plates, 3; deficiency of water, 1. Total, 162 (7 dangerous). Boilers without glass water-gauges, 10; without pressure gauges, 2; without blow-off cocks, 38; without back pressure valves, 78.

"An explosion has occurred this month to the boiler of a first-class passenger locomotive engine, by which 3 persons were killed and others injured. It was considered to be perfectly safe, had been on duty the previous day, and was being cleaned ready for work at the moment the explosion occurred.

"It will be remembered that reference was made in the July, 1861, report, to another explosion of a locomotive boiler, which took place while the train was running; and since that time three others have occurred in addition to the one first alluded to, thus making five during that period with this class of boiler.

"The cause of explosion in four of these cases proved to be thinning of the plates from internal corrosion. I have only had an opportunity of examining the plates of one of these exploded boilers, but from official reports, it appears that the corrosive action had developed itself in a very similar manner in each instance, which in the one personally examined was as follows:—The corrosion had eaten grooves or furrows parallel with and close to the edge of the overlaps of the plates, at some of the longitudinal seams of rivets; the furrows being on the outer plates of the overlap, while the deepest one, and that from which the explosion had sprung, was

situated nearly midway between the smoke-box and fire-box.

"This furrowing action will be at once recognized by those who have been in the habit of observing the influence of wear upon the ordinary internally fired double-flued boiler, in general use in Lancashire. In this boiler the furrow is found on the inner surface, both of the front and back end-plates, but more especially at the front, and lies close to the edge of the internal flue angle-iron, which it partially encircles; the furrow being deepest at the crown, and gradually dying out in about six or nine inches on each side. It is sometimes found in the root of the angle-iron itself; the choice of position between the plate and angle-iron, apparently depending upon their comparative power of resistance. When the plate of the furnace-tube is flanged, the furrow more frequently occurs at the springing of the flange than at the end-plate. Furrowing also is very commonly found at the transverse seams of rivets at the underside of boilers; the furrows in these cases being immediately at the edges of the overlaps, and most frequently on the external surface of the plates, but sometimes on the internal. This action is more severe in long boilers than in short ones, and at the middle of their length rather than at their ends. It is seldom, if ever, developed at the longitudinal seams of these boilers, except where leakage takes place, and is then found to be most severe when the objectionable plan of construction is adopted, of placing the seams of rivets in one continuous line from one end of the boiler to the other. Such are some of the manifestations of furrowing constantly met with in the boilers under the inspection of this association, and it may be interesting to attempt to trace the cause.

"Furrowing appears to be the result of corrosive and mechanical action combined. The mechanical action, such as an alternate buckling of the plates, strains and frets them, and thus renders them more susceptible to the influence of corrosion than the parts at rest. Where these furrows are internal, the corrosive element is furnished by the water, which is rarely, if ever, free from acidity; and when the furrows are found externally in the flues, as explained above, the corrosion may perhaps be attributed to the influence of gases.

"The cause of the buckling action varies according to the position in which it occurs.

"In the stationary boilers above referred to, when found in the front end plate, it may be ascribed to the alternate elongation of the internal flues, more especially at the furnace end; and, when at the bottom of the external shell, to the unequal expansion of the plates consequent upon the different strata of temperature in the water. The temperature of these strata varies with the distance from the bottom of the boiler, in proof of which it may be stated that it is frequently found that while the water is boiling on the surface, that at the bottom of the boiler will not scald the hand. Those boilers are most conducive to this inequality of temperature which have a defective circulation of water, are so set that the last heat from the fires passes beneath them, and fed with comparative cold water introduced at the bottom. It will be readily seen how these varying temperatures induce unequal expansion of the plates, and thus put upon the seams of rivets most irregular and severe strains. In this way, it is thought that the buckling action is produced, which results in furrowing at the bottom of stationary boilers.

"In locomotive boilers the buckling at the longitudinal seams, in the cylindrical portion of the shell, arises from its not being of true circular form in the vicinity of the overlaps. The tendency of the internal steam pressure is to correct this, and to induce a true circular form, and thus a cross strain, which may be correctly termed a 'girder strain,' is put upon the plates at a short distance on each side of the line of rivets; from this a change of shape ensues, which constantly varies with the pressure of steam. The position of the furrows is found to be that of greatest elasticity, being midway between the fixed ends of the fire-box and smoke-box, just where this buckling action would have most play. It will at once be seen that the thicker the plates the greater the leverage of the girder action, and thus to thicken their edges is only to aggravate the evil. The true circular shape may be maintained, as far as appearance is concerned, by substituting a butt-strip for the overlap, but this, from its one-sidedness, will not prevent the girder action, and, indeed, tends to make two furrows instead of one. Were an inner as well as an outer butt-strip introduced, the parts would be in equilibrio, and the strain then passing through the centre of the plates, they would be subjected to their legitimate tensile strain only, and the buckling action in question set at rest.

"But whatever expedients may be adopted to meet special cases, as one after another may force itself upon attention, some general precautionary measure appears to be needed to guard against the subtle influence of corrosion. It is often found, in a line of one hundred rivets, to attack ten and neglect the remainder; in an entire boiler, it will affect one or two plates and not the rest; and even in a series of boilers will select one in preference to the others. No doubt careful analysis might detect some predisposition in the metal, and thus account for the apparent anomalies, but the difficulty of foretelling the precise course of corrosion must be candidly acknowledged, and hence the necessity, as just stated, for the adoption of some sweeping precautionary measure, which will embrace every case without distinction.

"The association meets the difficulty with its own members by affording them the opportunity of having what is technically termed a 'thorough examination, of each of their boilers once a year, when all the seams as well as the surfaces of the plates, both outer and inner, are examined throughout, provided that the boiler is suitably prepared for the inspection. The conviction of the importance of these examinations — which such explosions as the one under consideration serve to deepen—may explain the frequency with which reference is made to this subject. Indeed, the association cannot hold itself responsible for the safety of any of the boilers under its charge, where the opportunity of making an annual 'thorough examination' is withheld. In addition, it recommends to those members using multitubular boilers, that such an arrangement of tubes should be more generally adopted as will admit of a man's gaining access between them and the shell for the purpose of examination, while those should apply the hydraulic test annually, who are employing boilers which will not admit of complete examination.

"From the experience derived from the boilers under the inspection of this association, it certainly appears hazardous to allow locomotives to work, as is very usually done, for five or seven years, without a complete internal examination; and it therefore becomes most important, either that some searching test should be adopted that shall at all times ascertain the sufficiency of the boilers without removing the tubes, or else that their construction shall be so modified that the parts may be rendered accessible to complete examination. The occurrence of four explosions to locomotive boilers, from internal corrosion, within the last eighteen months, must show the necessity of taking this subject into serious consideration."

SETTING BOILERS.

"Considerable difficulty is experienced in examining many boilers from the contracted area of the flues; some, indeed, are altogether inaccessible. Boiler-setting appears to be left too much to the individual tastes of the bricklayer, and, consequently, flues of every variety of proportions are met with. A sketch has been drawn up of the proportions most generally approved, and at an early opportunity a description will be given—which space does not now permit—for the assistance of those who are re-setting their old boilers or laying down new ones; meanwhile, a drawing lies at the office of the association for the inspection of members.

"L. E. FLETCHER, *Chief Engineer.*"

SHIP BUILDING.

DUMBARTON.—The ship-building trade at this port is in a busy state; the principal yards have their full complement of hands, and in some cases shifts are resorted to in order to the quick completion of the orders on hand. The engineer and foundry establishments are also in full operation. On Saturday afternoon, Messrs. William Denny and Brothers, famed for their superior iron screw steamers, launched a handsome vessel of that class from their south yard. Her dimensions are—length of keel and forerake, 255 feet; breadth of beam, 33 feet; depth of hold, 27 feet; and 1,360 tons builders' measurement.

MONKWEARMOUTH.—Messrs. G. S. Moore and Co., of Monkwearmouth, launched, on Wednesday last, a beautifully-modelled clipper barque, of 290 tons, named the "Agnes Holt." She is built on the mixed wood and iron, or combination plan, as it is called, and is the first constructed on this principle in the North of England. Mr. James Laing has also launched a splendid iron clipper of 612 tons, 12 years' class, called the "James C. Munro," sold to Messrs. George and John Munro, of London. She is 170 ft. long, 28 ft. beam, and 18½ ft. depth of hold. She is fitted with iron masts, Cunningham's patent topsails, &c.

THE MERSEY.—PROGRESS OF THE GOVERNMENT SHIPS, &c.—On Saturday, several ships were launched from the Liverpool and Birkenhead sides of the Mersey, Mr. John Laird's yard turning out a splendid Government troopship, called the "Orontes," and Messrs. Jones, Quiggins, and Co.'s yard two very fine vessels for merchant service. The Birkenhead Ironworks present a busy scene. There are from 2,800 to 3,000 hands in daily employment, and between 16,000 and 17,000 tons of shipping, warlike and commercial, in course of construction on the premises. Amongst the most prominent undertakings is the iron-clad screw frigate "Agincourt," which is intended for the royal navy. In another part of the yard, the two iron-plated rams, about which so many extraordinary rumours have been afloat, are rapidly getting into form, and to nautical men a very uncommon form it appears to be. With regard to the "Orontes," she is one of the improved class of troopships, of which the Government are building several—something after the style of the celebrated "Himalaya," but from 25 ft. to 30 ft. shorter than that vessel; her dimensions being—length, 300 ft.; beam, 44 ft. 4 in.; depth of hold, 22 ft. 6 in.; measurement (old) 2,811 tons. The engines—some portions of which are already on board—will be of 500-horse power, and are being manufactured by Messrs. James Watt and Co., of Birmingham. They are calculated to drive the ship at a high rate of speed, and the sailing capacity of the "Orontes" will be that of a barque full rigged in proportion to her tonnage. The "Orontes" is calculated for the conveyance of 1,200 troops and 70 officers. She will carry two pivot guns for defensive purposes, but must not at all be considered as a fighting ship. It is expected that she will be ready for service by the middle of February.

THE CLYDE.—Messrs. Burns have contracted with Messrs. Caird and Co., of Greenock, for two paddle steamers for the Royal Mail line between Glasgow and Belfast. Messrs. Napier are also occupied with a paddle for the same line, on which a new fleet will be engaged before 1863 has run its course. Messrs. L. Hill and Co. have just launched, at Greenock, a screw of 600 tons, built for the Calcutta and Burmah Steam Navigation Company. The vessel has been named the "Bussorah," and she is now being engined by Messrs. A. and J. Inglis, of Glasgow. Mr. A. Denny has completed a paddle named the "City of Dunedin," which is to be fitted with engines of 100-horse power, being intended to be employed by a colonial firm in the New Zealand trade. "The City of Melbourne," built by Messrs. J. and G. Thompson for the Australasian Steam Navigation Company, attained on her trial trip a speed of thirteen knots per hour; her burden 900 tons is builders' measurement, and she is 250

ft. long by 28 ft. beam, and 17 ft. depth, being fitted with a pair of four piston-rod geared engines. Messrs. W. Denny and Brothers have contracted to build for the Spanish mail service, through Messrs. A. Lopez and Co., of Alicante, a duplicate of the large and powerful vessel arranged for two months since. The steamers will be each of 2,000 tons burden, and will have 500-horse engines. Mr. A. Denny is also under contract to build a screw steamer for the Spanish coasting trade. The King of Burmah, calculating on the abolition of frontier duties, and the consequent probability of an increase of trade in his dominions, has ordered two powerful river steamers. He has also ordered a sea-going steamer, which is to ply in the Bay of Bengal. The contract has been taken by Messrs. A. and J. Inglis, through Messrs. Halliday, Bullock, and Co., of Rangoon. On the whole, the prospects of Clyde ship-building for the ensuing winter are considered tolerably satisfactory.

THE RIVER DEE.—The Roodee Ship Building Company has not been idle on the Dee. Saturday last witnessed the launch of a splendid new iron ship from the yard of that company, before an immense multitude of spectators. The following are the dimensions of the vessel, which is named the "Robinson Crusoe":—Length between perpendiculars, 202 ft.; extreme breadth, 34 ft.; depth of hold from floor, 23 ft. 3 in.; burthen, 1,116 tons, builders' measurement. Classed A 1 for twelve years at Lloyd's and at the underwriters.' The ship is intended for the East India trade, and has been built for Mr. M. I. Wilson, Hargreave's-buildings, Liverpool, who, we understand, has sold her to Mr. James Beazley, merchant, of the same town. The three lower masts and bowsprit are made of iron, and the lower yards of steel. The iron masts act as ventilators to the hold of the ship, having an inlet for air at the head, and a delivery for the same at the heel. The whole cabin arrangement is entirely on the upper deck, having the space below for cargo alone. All the channel plates are secured to the sheer strake inside. By such arrangement the vessel shows a complete flush outside. The Roodee Company has now on hand three large iron ships of 1,000 tons each builders' measurement.

The Company are also building a large iron parallel lift, or floating dock, for Messrs. Rose and Crowder, of London. It is to be erected in the London Docks, and it is anticipated that this dock will be a great acquisition to the shipowners of London, where dry dock accommodation is much needed. The dimensions of the dock are 190 ft. long, 60 ft. broad, and 17 ft. deep. The arrangements for lifting the dock after the vessel is floated on it are very simple, and are the patent right of Messrs. Rose and Crowder. The dock consists of a rectangular iron vessel, or pontoon, of proportionate dimensions, for lifting and carrying vessels of any size, which is lowered or sunk (by admitting water at pleasure) to the required depth for floating over it the ship to be lifted, and the ship being properly placed over the blocks, and shored in the usual manner, water equal to the weight of the ship is pumped out of the pontoon, and it is raised with the ship upon it. After the sighting, or repairs, are concluded, water is again admitted to the pontoon, which sinks, and the vessel is floated off. The rapid action of this system of dock, by which vessels can be raised for inspection in from 15 to 30 minutes, and floated again in as brief a space, together with the full exposure to light and air, enabling sighting and repairing to be conducted with such perfection and despatch, are amongst the more prominent of its many advantages. A working model of this dock has been exhibited in Class XII. of the International Exhibition, and been awarded honourable mention for novelty and simplicity of design.

THE THERMOGENERATOR.—A machine is being tried at Marseilles, called the "thermogenerator," in which the heat to be used in distilling is obtained by means of the friction of two surfaces. The steam and boiling water required are thus obtained without the direct use of fuel.

BOAT LOWERING APPARATUS.

THIS journal for years past has paid rather more than ordinary attention to Clifford's and Kynaston's systems for lowering and disengaging boats. After giving those rival systems the most impartial investigation, we were obliged, in obedience to principles and facts, to accord the largest meed of praise to Mr. Clifford for his invention. We arrived at this conclusion from no partiality. Indeed, were we inclined to be partial, our feelings would have induced us to advocate the late Captain Kynaston's system for the sake of his widow. Considerations of humanity and a strong conviction, however, prevented our doing so. We therefore share in the surprise which has been expressed by many naval officers at the tenor of a recent order issued from the Comptroller's Department of the Navy, directing that all new ships of war shall have their boats fitted exclusively with Kynaston's disengaging hook. We consider this order to be arbitrary and unjust. When a legitimate difference of opinion existed, the very least the Comptrollers could have done would be to have left the shipbuilder or officers of the ship to decide for themselves. Why impose such a condition when so many conscientiously consider that Clifford's system is the completest and the best? We assert, with the *Times*, "that Mr. Clifford's boat lowering apparatus has rendered good service in too many instances to be thus disposed of," and that the Comptroller will have to reconsider his decision preparatory to its revocation.

RAILWAY ROLLING STOCK.

A FEW days since Mr. W. Johnstone, President of the Institution of Engineers in Scotland, in his inaugural address, alluded, as a matter of course, to the International Exhibition. In the production, said that gentleman, of metals, chemicals, glass, and earthenware, and of all ordinary woven fabrics, we have undoubtedly distanced all competitors, with some very few exceptions. In the case of machinery, the department more peculiarly interesting to engineers, it may be said without exaggeration, that we have been first. There certainly is no comparison between our locomotives, our marine and land engines, our spinning and weaving machinery, our sugar-mills, and our tool making machinery, and those exhibited by our rivals.

Among the few exceptions referred to are railway carriages and their fittings, cast-steel forgings, and some of the unusual forms of rolled iron. It has long been matter of common remark, that the carriages of foreign railways were better and more comfortable than those of a similar class with us. This may be partly explained by the large proportion of old and badly-constructed stock still kept up by many companies in this country. But even allowing this, it must be admitted that foreign stock of railways is fully superior to our own; and there can be no doubt that the best foreign carriages exhibited were fully equal, if not superior, to those of English make. Many reasons have been assigned for this, but they may all be resolved into the simple fact that our foreign rivals have paid more attention than we have done to the proportions and quality of the fittings, and to the excellence of the workmanship in every minute particular. It is impossible to over-estimate the importance of attention to these points, not only as regards the comfort of passengers, but also as regards the question of economical working. Repairs and renewal of rolling stock form a very large portion of the working expenses of a railway; and to use stock after it becomes ripe for renewal is not only severe upon itself, but is equally injurious to the permanent way. The rail and the wheel are, in the words of Stephenson, "man and wife," and you cannot injure or depreciate the one without doing corresponding damage to the other. This great truth is now fully recognised in railway management, and is shown by the increased attention which is being paid to the improvement of rolling stock and of the permanent way; and I hope that such attention, coupled with the natural decay of old and objectionable rolling stock and its renewal, will soon enable us to surpass all continental railways in these all-important matters.

It must have struck every one that foreign carriage-fittings in iron, more especially those from France, were also fully equal to ours. They were certainly lighter, and very well made; and he was surprised at being informed that they were actually cheaper than with us, being only on an average 2½d. per lb. This is a somewhat astonishing result, if we consider that the raw material is 25 to 40 per cent. dearer in France than in Britain. We have almost all the materials for iron-making—the ore, the coal, and the lime, lying in close juxta-position, so that with us the cost of raw material is very small indeed. But in France they are widely separated, and the extra cost of carriage, compared to what it is with us, raises the price of pig-iron from 60s. to 90s., and of bar-iron from 130s. to 170s. per ton. It is very much to the credit of the French manufacturers that they can, in the face of this great difference against them, produce iron work of first-class quality as cheaply as in Britain.

They also produce angle iron, T-iron, and I-iron of extra sizes for smaller extra charges than those made by our makers; and they have carried the manufacture of these extra sizes and forms much farther than we have done; and he understands it is the case that many of these sizes and forms must be ordered by our Glasgow iron merchants from French and Belgian makers, and the prices are so low that I-beams, 12 in. deep, cost only £12 10s., and when 2 ft. deep, £20 per ton. There is no doubt that the advantages we possess for ordinary sizes and qualities, with proper skill and attention, ought to be carried into every branch of the manufacture. Were this done our foreign trade would be greatly extended, and the use of iron would be adopted to a larger extent in many kinds of industry.

A good deal of the uncertainty attendant on the introduction of iron-making, arises from the obscurity which still surrounds many of the chemical changes that take place in its various stages. This obscurity can only be removed by accurate experiments on a large scale.

THE GOVERNMENT INSPECTOR UPON EXPLOSIONS OF GAS.

MR. MATHIAS DUNN, the Government Inspector of Mines for the North of England, in his latest pamphlet entitled "How to prevent Accidents in Coal Mines," says that, although explosions are not so extensively fatal as falls of roofs, yet they come upon the public mind with more appalling effect, because the calamity is sudden, is generally unlooked for, is attended with numerous deaths, and the grief extensively circulated amongst friends and relatives, many of whom are left unprovided for; inasmuch as they not only include a number of persons by the same stroke, but for the damage done to the mine, and the time required for the restoration of the ventilation, so that great delay often takes place, attended with prolonged anxiety and excitement, independent of the loss of life from the after-damp arising from the explosion.

Much delusion often prevails regarding the actual state of that part of the mine were the explosion originates, which may be altogether at variance with its general condition; therefore it will be well to particularize some of the chief circumstances in such a case.

1st. The colliery may be generally deficient in ventilating power in regard to the aggregate column.

2nd. The general ventilation may be unobjectionable; but it may be either too much diffused, or ill arranged, and inadequately guided.

3rd. However well arranged, in a general point of view, each working place may require the aid of brattices and doors to carry off the gas discharging from the coal, and this again demands adequate attendance.

4th. These doors and brattices may be ill-constructed, or may be formed of small coal, or canvas, or neglected to be carried forward sufficiently near the face.

5th. Some unusual discharge of gas from a blower or bad coal may overpower the air, which is ordinarily sufficient.

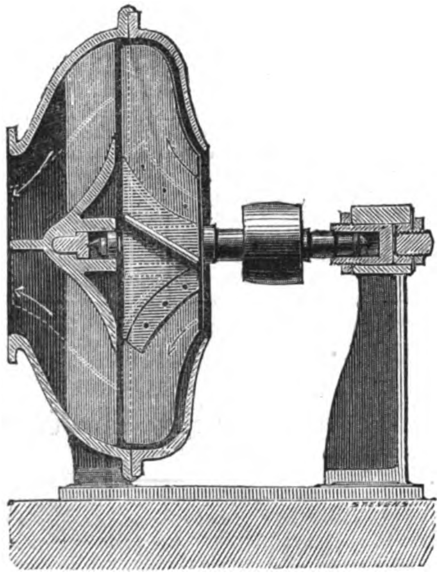
6th. Falls or stoppages may take place in the workings or the waste, so as to derange or adulterate the air, and so take the naked lights by surprise.

7th. Often the use of safety lamps is left to the management and discretion of the colliers. Where they are agreed to be necessary, they are often suffered to become imperfect, and to go unlocked, as also to be opened for the purpose of blasting the coal, which not unfrequently leads to mischief, whilst the colliers sometimes covertly draw the flame through the gauze to light their pipes.

8th. The mischief of after-damp is greatly increased if the excavations wherein the bearing stoppings are placed be wide—if the stoppings are built of wood, or made of small coal. Therefore, in all well-regulated collieries, the permanent stoppings are built of brick or stone, plastered with lime, and supported by several yards of stowing.

PETRIE'S IMPROVED BLOWER OR FAN.

THE accompanying engraving shows in section a view of an improved blower, recently patented by Mr. J. Petrie, of Rochdale. The invention



consists in placing the blades on the revolving spindle, at an angle so as to throw the air off in the direction of the axis, after which it passes to a conical or other shaped chamber provided with partitions, so as to form a number of compartments.

LIGHTNING CONDUCTORS.

ACCORDING to a correspondent of "Cosmos," each of the two columns of Antonine and Trajan at Rome, sustains a colossal bronze statue, and the columns, not being in a state of conduction with the earth, are in danger of being injured by lightning. In fact, accidents have already happened, but as yet without causing any great damage. The preservation of these monuments is a matter of interest to the whole civilized world, on account of their historical value. Their precarious state is such that Napoleon III. has lately had a complete model of the column of Trajan made for his own use in writing the biography of Cæsar. Professor Volpicelli, in 1848, proposed to protect these structures by means of a conductor, arranged like the one on the Duke of York's column. From various reasons, political and otherwise, this has not been done.

Some persons have urged that the best plan would be to use a number of lightning conductors placed on the surrounding buildings. It has, however, been shown that this indirect protection is worse than useless, being, in fact, absolutely dangerous. Professor Mossotti has, on this subject, thus expressed himself in a recent paper on lightning conductors:—"If, instead of placing a lightning conductor *directly* on to the column, you place a series of conductors on the neighbouring houses, any given flash of lightning, instead of being deviated from its course, will be directed towards the column you wish to protect. The surrounding air, being in a low state of polarization by the action of the conductors, will absolutely prevent the lightning from taking a side direction." These observations are, of course, just as applicable to tall factory chimneys as to classical columns.

While upon this subject, we will give some extracts from a paper on Lightning Conductors, lately read to the Academy of Sciences of Paris by M. Calland. He states that lightning conductors are being made in France of thin brass wires. As is well known, the coefficient of conduction of this alloy is 12, that of iron 16, and that of copper being 100. Metals also get heated by the electric fluid in an inverse ratio to their respective powers of conduction. The chains of suspension bridges have been broken in this way. If brass be not so liable as iron to combustion, it is more fusible; and a conductor made of this material might get fused by a violent electric shock.

M. Calland states that he makes his cables of seven strands of copper wire there being seven wires to each strand; this number permits of the wires being twisted together with fewer intermediate spaces. He also states that the humid conductor of the ground is usually not made equal in conducting power to the one of metal. The custom is to untwist the end of the cable, and to place it into some water. The conductor having a sectional area of one square centimetre, its conducting power will be represented by 91,440,000; that of silver being 100,000,000. The relative conducting power of distilled water being only 0·0133, a moist surface of 700 square metres would be necessary in order to reach the conducting powers of the cable. In case of a violent shock, such a small surface as this would almost form an insulation. M. Calland proposes to place the end of the rod touching the ground in animal charcoal, and to surround the latter with a quantity of coke. These two substances are excellent conductors of electricity, and the porous nature of coke renders it admirably fitted to increase the surface of contact of the conductor.

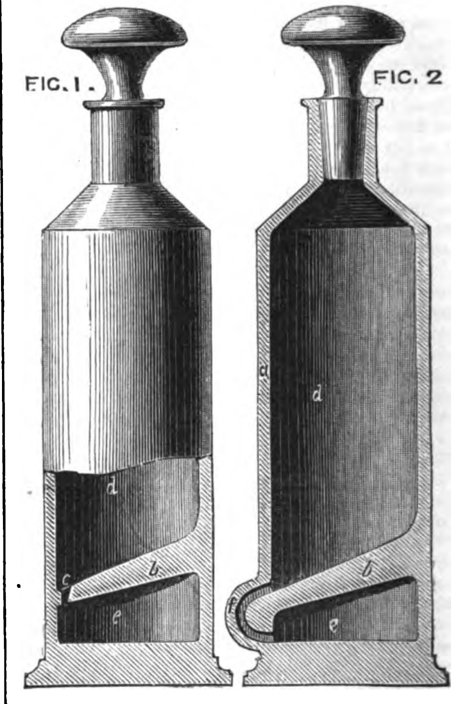
A SALT WELL.

ACCORDING to American accounts, a novel salt mine has been discovered at Wellsville, in the county of Columbiana, Ohio. A well was being sunk, on the artesian principle, for extracting rock oil, when, at a depth of 488 ft., a column of gas made its escape with such violence that the boring rods and some 200 ft. of piping introduced into the crifice were suddenly thrown out like a ramrod from a gun. The boring had reached an extensive vein of salt brine, and the gas continued to drive out with it a column of water charged with salt, and of the same diameter as the bore hole, to the height of 150 ft. This eruption lasted for six months, when it occurred to the proprietors to utilize the waters for the manufacture of salt. The gas itself being conducted into a furnace by pipes is lighted, and it then evaporates the water without any other fuel being used. The furnace is heated to a high temperature, and the flame rises above the chimney. It is seen from a distance of several miles round. The salt brine is delivered at the rate of about six gallons per minute, and furnishes one barrel of salt per hour. The gas is said to have a pressure of 126 lbs. to the square inch.

DREWETT'S IMPROVED BOTTLE.

MR. E. DREWETT, of Blackheath, has obtained a patent for a bottle having a partition near the bottom, for the purpose of separating and filtering the contents, as shown in the engraving. The sediment of the liquid in the bottle *a* is allowed to settle and pass through an aperture *c* in the

FIG. 1. FIG. 2



partition *b*, and retained in the space *e* between. Fig. 1 shows a partial section of a stoppered bottle, having a division piece or partition as above mentioned; and Fig. 2 is a view of a bottle in section having a bulge *f* in the side thereof, through which the aperture is made. Bottles so constructed may have their contents decanted, and the whole of the sediment retained in the lower chamber.

STRENGTH OF GUNS AND HOW TO CAST THEM.

THE *Journal of the Franklin Institute* contains an account of an important conversation which took place at a late meeting of the Institute, on the subject of the metal, the moulding, casting, and cooling of large cannon. W. W. W. Wood, Chief Engineer of the U. S. Navy, who was present, stated that very great difficulties had been experienced in the casting of heavy ordnance. It was found that guns made of highly elastic cast iron were capable af greater endurance than guns made of more dense iron possessing greater tensile strength. He had been connected with a set of experiments wherein it was demonstrated by practical tests that heavy pieces of ordnance, the iron of which was capable of withstanding from 39,000 to 40,000 pounds' tensile strain per inch, with a corresponding density of metal, were not capable of the endurance of similar pieces made of iron which did not sustain a tensile strain of more than 17,000 and 23,000 pounds per inch, and which was of less specific gravity or density. In the lattter case, one gun sustained, in addition te the proof charge, over 1,700 service charges with no perceptible enlargement except of the vent and slightly furrowing indentations leading to the same. This is certainly useful information on this subject, as it has generally been held that the most dense cast iron was the best for guns of all sizes. Chief Engineer Wood also stated that the accepted theory as to the cause of the breakage of heavy guns was, that in the ordinary method of casting and cooling, the exterior portions on cooling first produced a strain by unequal shrinkage in the mass. Cap-

tain Rodman's method of casting large guns hollow, and cooling the interior with a stream of water passing through the hollow core, is intended to obviate this evil, by equalizing the shrinkage on the inside and outside. Captain Dahlgren's method to obviate t e evil consisted in casting the gun more nearly in the form of a cylinder, then turning off the additional metal on the exterior which had caused the strain in unequal shrinkage, by having been first cooled in the mould. His guns were cast solid, then the interior part, supposed to be the weakest, is bored out. The new 15-inch Dahlgrens for our armour-clads are cast hollow and cooled upon Captain Rodman's principle, but their rough form approaches to that of a cylinder 38 inches in diameter at the [illegible], which i afterwards turned off [illegible] in. All the English 13-inch cast-iron mo[illegible] used in the bombardment of Sweaborg [illegible] in two equal halves after an average of [illegible] rounds. The age of a gun has much to [illegible] its durability; the older it is, the gre[illegible] number of charges will it withstand before [illegible]. Chief Engineer Wood believes the great cause of bursting in heavy ordnance is owing to unequal expansion between the interior and exterior portions of the gun when being rapidly fired. The interior is first heated before the exterior acquires a corresponding temperature. A strain by such unequal temperature is exerted upon the gun equal to the difference of expansion due to the difference of elongation of the masses of iron. The gun which exploded on board of the *Naugatuck* afforded proof for entertaining this opinion.

Mr. John W. Nystrom, who was present, stated that it was a bad practice to cast a gun solid and turn off several inches of the exterior afterwards, according to the method adapted for the smaller Dahlgren guns. The strongest part of the gun is thus turned off. He had made experiments in Russia with cast-iron bars 1 in. square and 2 ft. long. One bar was cast the correct size, and the other cast 2 in. square, then planed off half an inch on each side, reducing it to 1 in. The lateral strength of these bars was carefully tested, when it was found that the one which was not planed was 25 per cent stronger than the other. He had made cast-iron rollers for rolling angle irons, which were so correct that when taken from the moulds and centered in a lathe there was but a mere trifle of work to be done by the tool. The mould was turned in the flask with an iron sweep of the correct shape of the roller, and no allowance made for turning the roller when cast. Since his return from Russia he had seen similar rollers moulded with wooden sweeps at Phœnixville, Pa., and about ⅛ths of an inch was allowed for turning off in the finishing—just enough to take away the most valuable part of the roller. The mould should not only be formed by an iron sweep, but the blocking and finishing ought to be accomplished with the same instrument and the finishing of the roller could afterwards be effected by simply grinding with emery, and thus the strongest part of the casting retained. This is the principle upon which Mr. Nystrom proposes to mould and cast guns. He believes that rifle guns may be cast so perfect that they can be taken direct from the foundry and used in active service. He would employ Rodman's process of cooling the gun from the core for the purpose of hardening it, and would then cool the entire gun by the mode in use for annealing the Whitney car-wheel, by allowing one day for cooling each inch of calibre, or 11 days for an 11-inch gun. When the gun has cooled down to 400 deg. Fah., it should be lifted from the pit, the muzzle closed with a wooden plug to prevent the air conducting away the heat from the bore, and the outside should be cooled with water to the temperature of the atmosphere. No water should then be permitted to get inside. The object of this last cooling operation is to give the metal in the bore a slight tensile strain, while that on the outside is slightly compressed. When a gun thus made would become hot by firing, there would be the least strain in the metal by shrinkage, and a very strong gun would thus be secured. Formerly, iron guns were cast finished on the outside—they were, at least, seldom turned.

Legal Intelligence.

BETTS V. MENZIES.

This is the great patent case, in which the House of Lords have recently given a decision of, perhaps, greater pra[illegible] not merely to that large class of per[illegible] of inventions, but to that still larger [illegible] deeply interested therein, the commercial community and, indeed, it may be said the community at large; the point decided, in [illegible], being that not the man who originally, [illegible] matter of mere scientific theory or suggestion, hit upon some idea of the invention, but the man who first makes it commercially practicable and of practical value to the community, is entitled to patent it. The action was upon a patent obtained by Betts, the plaintiff, in January, 1849, "for a new manufacture of capsules, and of a material to be employed therein, and for other purposes." The action, for its infringement by the defendant, was brought in March, 1857, and tried before Mr. Justice Erle and a special jury in January, 1859. It was proved that by following the [illegible] contained in the plaintiff's specification, a workman of ordinary skill could produce the manufacture therein described, and that the same was a useful and valuable article of commerce. It was set up on the part of the defendant that the plaintiff's invention, or some part of it, was included in the specification of a patent granted to one Dobbs, so long ago as the year 1804. On the other hand it was contended, on the part of the plaintiff, that it was impossible to ascertain the meaning of Dobbs's specification without evidence, and that its practical effect was for the jury upon such evidence; that Dobbs published nothing which could give any practical knowledge of the invention [illegible] pended on the combination of lead and tin), but that, on the contrary, that which he had published actually, instead of leading to the discovery, misled and led away from it, and that it was open to the defendant to prove all this by evidence before the jury, for them to determine thereon as to whether there had really been any practical discovery and disclosure of the invention by Dobbs, the alleged prior inventor. Mr. Justice Erle in effect so held, and left the evidence to the jury, who found in favour of the plaintiff. There was then a rule for a new trial, on the ground that the verdict was against the evidence, or to enter the verdict absolutely for the defendant as a matter of law, on the ground that such evidence was not admissible, and that in law Dobbs's specification was a discovery and destroyed the novelty of the plaintiff's invention. The Court of Queen's Bench made the rule absolute to enter the verdict, on the latter ground, for the defendant; the rule for a new trial, on the former ground, standing over. The Court of Error, in July, 1860, upheld this decision; but the House of Lords last session reversed these judgments, and thus upheld the original direction of the learned judge who tried the cause, Mr. Justice (now Lord Chief Justice) Erle, and likewise affirming the correctness of a similar ruling by Mr. Baron Bramwell on the trial of the great gaslight patent case—"Hills v. the London Gaslight Company." Pending this litigation, one of the Vice-Chancellors (Wood) had given the plaintiff an *interim* injunction; but, on the judgment of the Court of Error affirming that of the Court of Queen's Bench, his Honour dissolved that injunction, being of opinion that, as wise judges had decided against the patent, it was not proper to continue the injunction merely because an appeal was pending to the House of Lords. And meanwhile, on the 8th of June, 1859, on the judgment of the Court of Queen's Bench being given in favour of the defendant, he signed judgment in the action. Afterwards the House of Lords reversed the judgment. Thereupon in this term Mr. M. Smith, Q.C., on the part of the defendant, got a rule to re-enter the case on the new trial paper, to have it argued on the ground which had been reserved, viz., that the verdict was against the evidence.

After a long argument between the counsel on each side,

The Court—though with great doubt—said they thought that upon the whole there was no sufficient ground to deprive the defendant of his legal right to have the case re-argued upon the effect of the evidence. They had little doubt that the defendant had meant to treat the judgment as final, and had not intended to "have two strings to his bow," and reserve the effect of the evidence, but relied rather on the probability of the judgment of this court and the Court of Error being affirmed by the House of Lords. As, however, they did not think that the plaintiff had been at all prejudiced, and were of opinion that the Vice-Chancellor would have taken the same course had all the facts been before him as they now stood, they could not [illegible] case being re-argued on the [illegible].

It was intimated that the [illegible]re reading of the evidence (the case having [illegible] six days to try), would take so long a time that the [illegible] must be put off till next term.

THE PNEUMATIC DESPATCH COMPANY.—The transmission of parcels and small goods from [illegible] to station, through a confined iron tube by [illegible] atmospheric exhaustion and pressure, will [illegible] commenced. The London and North-Western Railway Company having granted a site for the [illegible] and receiving-house, rent free, at Euston-square, a few yards from the Clearing-house; the d[illegible] of the Pneumatic Despatch Company [illegible] commenced operations by laying down [illegible] the road-way of Upper Seymour-stre[illegible] iron tubing about half-a-mile in length, [illegible]ending from that terminus to the post-office in Eversholt-street, under the superintendence of their engineer, Mr. T. W. Rammell. Within the iron tube, which is about 2 ft. 9 in. high, and 2 ft. 6 in. wide (its section being similar to that of a railway tunnel in minature), are two small ledges, or rails, on which the wheels of the small cars bearing the parcels will run. These will be propelled backwards and forwards, on the signal being given, by the exhaustion and pressure of the air in the tube. The immense disc and chamber in which it revolves have been removed from Battersea, and are being erected within the walls of the station and receiving-house. The disc, or wheel, is 21 ft. in diameter. It is composed of three sheets of [illegible] the [illegible] which form the outside [illegible] about [illegible] eighth of an inch in thickness, while [illegible] centre and smaller [illegible]n inch thick. These are screwed on to [illegible], which radiate from the centre of the wheel, [illegible] form 32 cavities, there being a distance between the plates at the rim of nearly two inches. Air chambers pass beneath the disc, which are exhausted by [illegible] revolutions in the race chamber. The wheel will be worked by a diagonal direct acting high-pressure engine of about 15-horse power. As regards the speed which will be attained, the railway company have only stipulated for a *minimum* of 15 miles, but from experiments it has been shown that a speed of 35 miles can be attained. [illegible] no doubt, will prove a most important acquisition to the Post-office in the quick delivery of the mails. A number of workmen are now engaged in the construction of this line, which is expected to be finished in about a month's time. Arrangements have been made with Messrs. Pickford and Co., who have offered a site for the proposed station in Gresham-street, at a small rent. It is also proposed to form stations at Smithfield and Holborn-hill, which will be suitable for the large and small parcels traffic.—*The Times.*

The dredging of Portsmouth Harbour is likely to afford permanent and successful results. Three years since the depth of water at low water spring tides was 12 ft. 6 in.; but in the early part of the present year it has been increased to 17 ft. giving a depth of 27 ft. at high water neap and 30 ft. at high water spring tides. The great advantage to be gained will be that ships of the largest draught will be able to pass in and out of Portsmouth harbour at high water every day in the year.

At the last meeting of the Royal Geographical Society, a letter by Dr. Livingstone, and his brother, Mr. Charles Livingstone, on the Lake Nyassa in Africa, was read by Dr. Norton Shaw. After describing the settlement of the Oxford and Cambridge Mission, the letter gave an account of the exploration of the Lake Nyassa. They took several soundings, the greatest depth obtained being 696 feet. The natives were, upon the whole, civil, and the population dense. The exploring party was obliged to turn back, although in sight of the large mountain masses to the north, in which Dr. Livingstone thinks it probable the lake ends, in consequence of the land party having fled, the provisions being expended, and the land desolated by the slave-trading expeditions from the coast. The whole distance of about 600 miles, going and coming, was accomplished in about three months. The doctor and his party were about to carry a small steamer, in pieces, past the Murchison Cataract, in order to navigate the lake, which was nearly 200 miles long, with a breadth of about 50 miles.

VAILE'S IMPROVED PROPELLERS FOR SHIPS AND BOATS.

FIG. 1. FIG. 3.

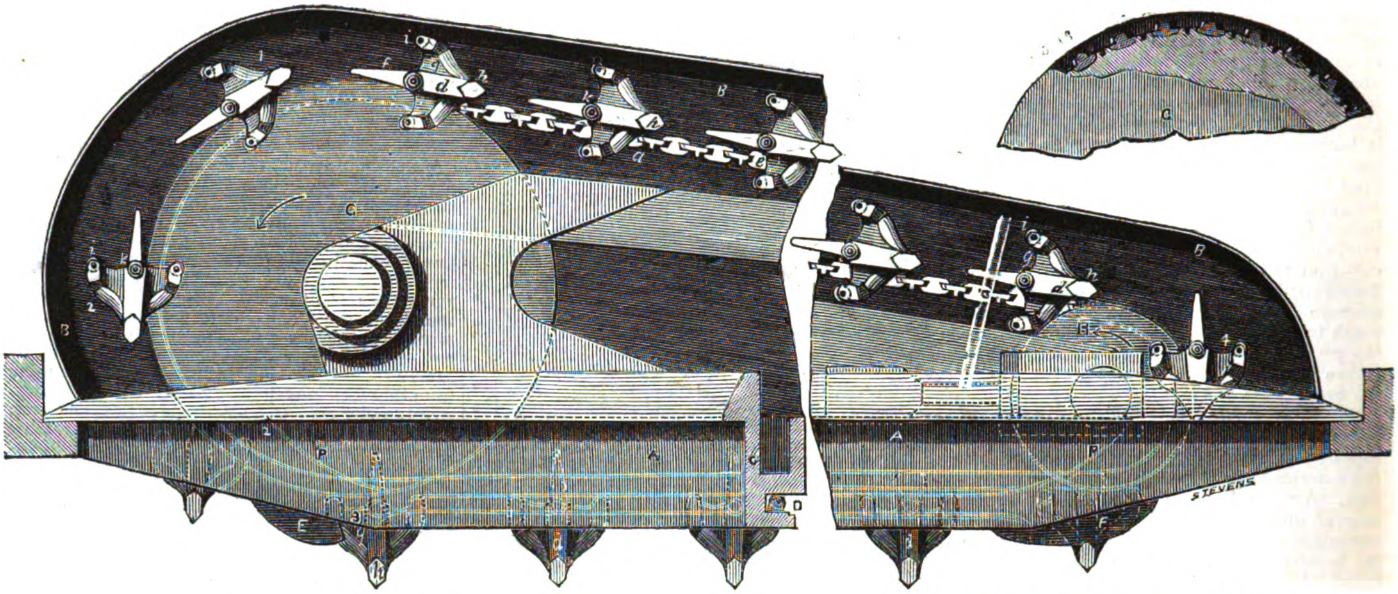
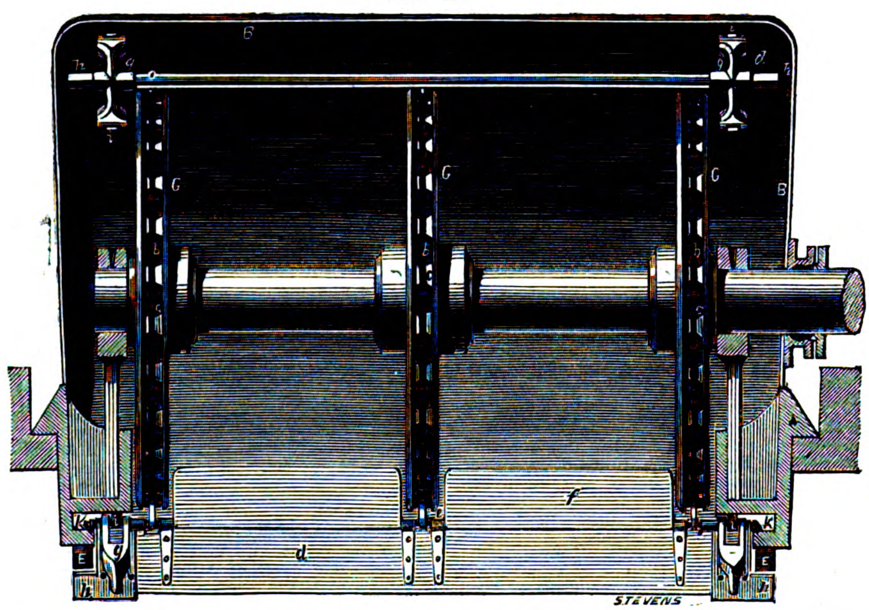


FIG. 2.



VAILE'S IMPROVED PROPELLERS FOR SHIPS AND BOATS.

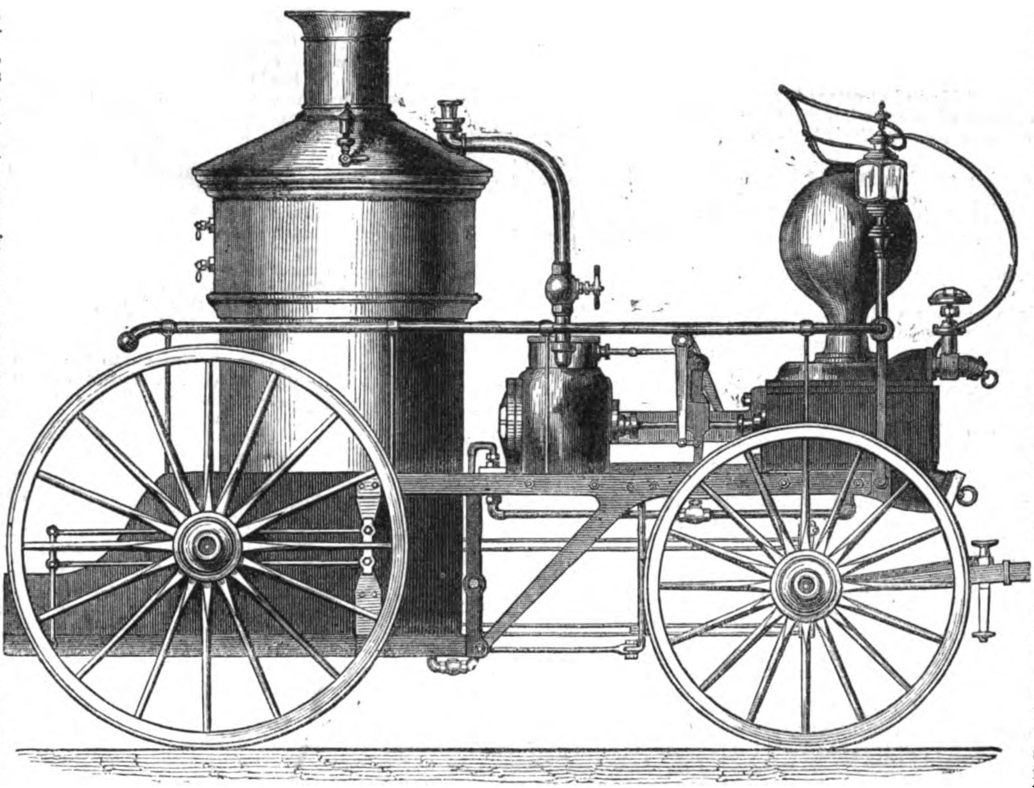
This invention, recently patented by Mr. R. Vaile, of Maida-hill, and Auckland, New Zealand, consists of endless chains of peculiar construction, having floats attached to them. The chains and floats pass round collars or drums mounted upon shafts which are driven by steam or other power. Fig. 1 of the above engravings is a side view of the propeller. Fig. 2 is a transverse section of the same. Fig. 3. is a side view of a portion of one of the collars G. The whole of the floats and chains above the water line are enclosed in a suitable casing. The chains are made of flat links, each alternate link having a tooth *a* on its underside, which takes into indentations *b* formed in the collars, while the alternate links lie in suitable slots *c* as shown at Fig. 3. The floats *d d* are connected to the chains by means of links *e e*, forming part of the chain, and made with an eye for receiving a pin, secured to a float by straps. The upper parts of the floats *f f* have portions cut away to allow of their working between the collars G, as shown at Fig. 2. Each float *d* is furnished with projecting arms carrying rollers *i i*, and a central flanged roller *k*. The projections *h* act upon the guide E, and prevent the floats entering the water in a wrong position. A is the lower frame, which is to be fixed to some part of a vessel, so that the floats may work below the water line. B is a casing secured to the frame.

The inventor prefers to fix two propellers, one on each side of the keel, and at or about the centre of the ship. The frame A is formed with double sides C C, and with a groove D, with surfaces for the rollers *i* and *k*, to travel on. The frame carries the bearings for the support of the shafts and collars. The collars H are of less diameter than the collars G, but are otherwise similar, the chains are carried round the collars G and H in the direction of the arrows, and for the purpose of keeping the chains tight, the bearings for the collars H are free to slide in slots. They may be acted upon by jacks or otherwise. Upon rotary motion being communicated to the shaft of the collars G the floats are caused to move and assume the position shown at Fig. 1. When travelling along the upper part of the frame, the floats lie parallel with the chains, the flanged rollers *k* resting upon rails formed to receive them. As soon as each float reaches the point marked 1, it commences to alter its position; and when it reaches the point marked 2, whether it descends in the reversed position or not, then its arms, coming into contact with the curved ends of the guides P or E, it assumes the position marked 3, and is made to retain that position by rollers *i i* coming in contact with bottom of the upper surface of the groove D, and the central flanged roller K coming in contact with the flange. In this position the floats are maintained until they are feathered to leave the water. This feathering is effected by the pressure of the water and the contact of the appliances attached to the floats and guides. The floats then assume the position 4, and afterwards lie parallel with the chains. In order to "go astern," it is simply necessary to reverse the engine, thus changing the direction of rotation of the collars and chains when the same positions will be assumed by the floats passing over the smaller collars H, and in their course from those collars to the collars G, as were assumed by them when propelling "ahead," as before mentioned.

The engineers have completed the survey of the proposed railway from Crieff to Comrie. The line will pass through the Crieff meadow, thence aross the Turret, and along by Sir David Baird's monument on the north bank of the Earn, till it reaches a field at the east end of the village of Comrie. The promoters propose to make the terminus at the east end of the village, for by doing so the railway would not require to be put across the rivers Lednock or Earn, which would effect a saving of at least £1,200.

At the last monthly meeting of the Northern Institute of Mining Engineers, the president, Mr. Nicholas Wood, congratulated the members on the decision arrived at by the Council of the British Association to hold their next annual meeting at Newcastle, and said it would be incumbent on that institute to take steps to add to the success of the meeting. There was much of great interest to be seen in the neighbourhood, and he was sure that it would be of great pleasure to all present to aid in showing every attention in their power. The annual meeting of the institute, which was held in Birmingham last year, was so successful that it was then determined to hold these aggregate meetings frequently, and as the British Association would meet in Newcastle next year, it perhaps would be considered advisable to hold their next aggregate gathering here at the same time.

LEE'S IMPROVED STEAM FIRE-ENGINE.



THIS machine, manufactured by Messrs. Easton, Amos & Sons, was subjected to a severe trial test on Monday last, in Mr. Hodges's distillery ground, Lambeth. It is patented by Mr. Wellington Lee, of the firm of Larned and Lee, New York. In producing the machine particular attention has been given to the following points:—Lightness, compactness, and portability, and the obtaining the utmost possible amount of pumping power upon a machine which can be conveniently handled by two horses. Time of getting up steam, and getting generally into operation. General safety, and the greatest amount of security obtainable against derangement in transit or accident in actual work at a fire.

One of the chief points in this engine is its arrangement as a duplex engine; the piston rod of one steam cylinder actuating a lever wheel opens a steam slide valve of the other cylinder; and by a peculiar arrangement of the parts, the end of the stroke of each is turned upon a cushion of steam. By this means there is no dead centre about the machine; at the moment one piston is turning its stroke, the other is at its greatest force.

The proportions of the Engine E size are—

No. of steam cylinders	2
Diameter of ditto	9½ in.
Length of stroke	9½ ,,
No. of water cylinders	2
Diameter of ditto	5½ in.
Length of stroke	9½ ,,

The peculiar construction of the pumps employed enables all the valves to be readily got at, and further, in cases where quantity of water is mainly required, the pump pistons can be removed in a short space of time, and others of 6½ inches diameter substituted. The arrangement and construction of boiler admits of almost any amount of steam being obtained while running.

CAPTAIN COLES' IRON MASTS FOR SHIPS.

CAPTAIN COWPER COLES, of Southsea, whose inventions in shields for ships of war are well known, has just patented an improvement in iron masts suitable for ships of war as well as merchant vessels. The masts are constructed of a central and two side tubes of iron or steel. The tubes pass through and are keyed to the decks, the central tube being carried in a direct line, while the two side tubes extend from the central tube at their bases, and are carried up at an incline till they unite with the central tube at or near the upper part. The central tube is continued upwards to form the topmast, or a separate tube is fitted thereto. The mast becomes as it were self-supporting, and shrouds and other supporting rigging are dispensed with.

CAPTAIN COLES' IRON MASTS FOR SHIPS.

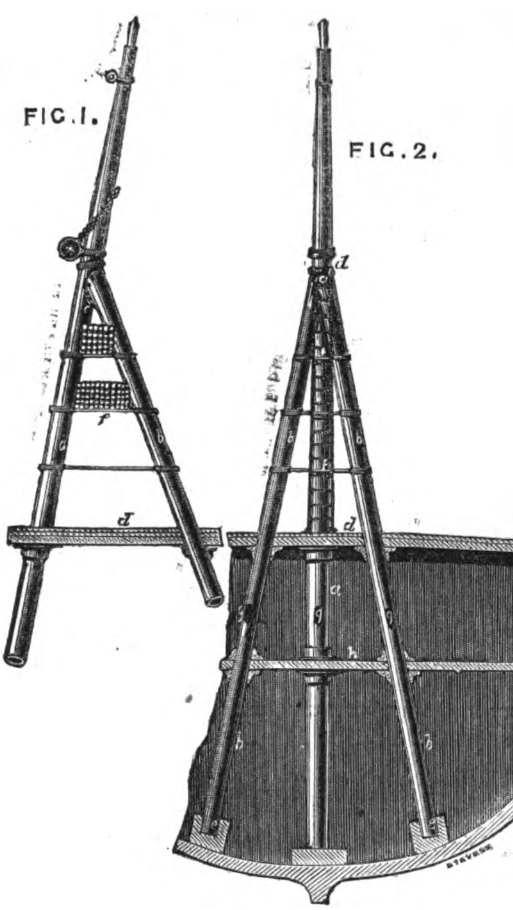


Fig. 1 of the accompanying engravings is a side elevation, and Fig. 2 a back view of a mast constructed according to this invention. *a* is the central tube of mast proper, and *b b* are the side tubes united to each other at their upper ends, and to the central tube by means of bolts passed through flanges or otherwise; *c c* are strengthening plates. The central tube *a* is continued upwards to form the topmast. The tubes are keyed to the deck *d*, the central tube *a* is carried down to and stepped to the "kelson," while the tubes *b b* are stepped in the "bilge" of the ship, as shown at *e e*, or they may be cut short, and secured to the lower deck *h*; *f f f* are tie rods for uniting the tubes, and for supporting a flooring, round which hammocks may be fixed as shown, to afford protection to riflemen stationed on the flooring; *g g g* are apertures in the tubes *a* and *b b*, through which ropes or chains for working the sails, which the inventor prefers to be fitted with Cunningham's patent reefing apparatus, may be carried to the lower deck *h*, in order that the men working the sails need neither be sent aloft nor exposed on the upper deck *d*. Cross trees may be fitted at the junction of the tubes, and a top for carrying a topmast may be added instead of the tube *a*, itself forming the topmast.

TO CORRESPONDENTS.

RECEIVED.—E. L., Capt. N., W. A., Capt. C. P. C., B. W., E. E. W., J. J. L., P. J., B. C., J. B., J. N., G. C., W. E., H. E., J. R. T., B. C.

S. H.—No doubt there are several efficient smokeless grates. We would refer our correspondent to our last number, where, in our article on "Locomotives," there is an account of two plans, and the general theory upon which the most of the coal-burning arrangements are based. A good fireman is a smoke-burner with any grate, and almost any kind of coal.

"NOBODY" (Holloway).—Your method of signalling appears to be a good one, but a patent was obtained by Mr. J. Fenton, of Low Moor, in 1856 (No. 2,520) for a similar invention. Unfortunately, there is no lack of inventions for signalling, but great unwillingness on the part of railway executives to adopt improvements.

We have been informed that Cutts, Sutton and Co. did not exhibit in the 13th class of the International Exhibition, as stated in our article on "Philosophical Instruments," on the 10th of October last.

Correspondence.

[*We do not hold ourselves responsible for the opinions of our Correspondents.*]

INVENTION BY NAPIER, OF MERCHISTON.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—The following very singular memorial of the celebrated Napier, of Merchiston, *inventor of the Logarithms* (may prove just now of service to the Emperor of China in any of his Quixotic plans), was presented to the War Office on the 7th of June,

A.D., 1596, is found in the 12th volume in the manuscript papers of Anthony Bacon, Esq., in the Lambeth Library, marked 658, anno 15996, Vol. V., which being unprinted, I send it *talis qualis*, to your useful magazine, as a curiosity.

I am, &c., J. B.

"*Secret inventions, profitable and necessary in these days for the defence of England, and withstanding of strangers, enemies to God's truth and religion.*

"First. The invention, proof, and perfect demonstration, geometrical, algebraical, of a burning mirror, which, receiving of dispersed beams of the sun, doth reflex the same beams altogether united, and concurring precisely in one mathematical point, in the which point, most necessarily it engendreth fire, with an evident demonstration of their error, who affirmeth this to be made a parabolic section. The use of this invention serveth for burning of the enemy's ships, at whatsoever appointed distance.

"Secondly, The invention and sure demonstration of another mirror, which, receiving the dispersed beams of any material fire or flame, yieldeth also the former effect, and serveth for the like use.

Thirdly, The invention and visible demonstration of a piece of artillery, which shot passeth not lineally through the army, destroying only those that stand in the random thereof, but superficially ranging abroad within the whole appointed place, till it hath executed its whole strength by destroying all those that be within the bounds of the said place. The use hereof not only serveth greatly against the army of the enemy on land, but also by sea, serving to cut down and destroy at one explosion the whole masts and tackling of so many ships as be within the appointed bounds, as well as abried as in large, so long as any strength at all remaineth.

Fourthly, The invention of a round chariot of metal, made of the proof of double musket, whose motion shall be such, that those that be within the same shall be more easy, more light, more speedy, and more safe in battle, than any hitherto contrived. The use hereof in moving is to break the array of the enemy's battle, and to make a passage, as also staying and abiding within the enemy's battle. It serveth to destroy the environed enemy, by continual charges and shot of the harquebuse, through small holes, the enemy in the meantime being abased, and altogether uncertain what defence or pursuit to use against a moving mouth of metal. These devices, besides inventions of sailing under water, with divers other devices and stratagems for harming of the enemies, by the grace of God, and work of expert craftsmen, I hope to perform.

(Signed) "JOHN NAPIER, of Merchiston,

"Anno Domini 1596, June 7th."

THE INSULATION OF THE PROPOSED PERSIAN GULF CABLE.

SIR,—It is very generally known that a long cable of some thousand miles or upwards is projected for the Persian Gulf. The matter has been decided on, and sample lengths for testing purposes have been sent to the Indian Board by different cable manufacturers. We may assume that a variety of methods of insulation are comprised therein, as well as the principal insulating agents—gutta percha and india rubber, also combinations of the two.

At this stage of affairs, therefore, and before any contract is entered into, it will not be irrelevant to take into consideration the subject, as to which material, and special application of such material to the conducting wire, would be most suitable for the proposed cables.

And first, as to gutta percha, which is, as we know, a good insulator, far better, in fact, than any of the compounds which have been invented as substitutes; but the difficulty is in getting it pure. And even supposing this overcome, we cannot be ignorant of the fact of the utter impossibility of insulating a wire therewith (to whatever thickness within reasonable limits) so as to have it as electrically perfect as circumstances require, it being, in reality, too much of a conductor to be an insulator of the first class. These considerations, of course, apply to all ordinary cases in which it is used, and where the temperature is too low to affect the gum. But this matter of temperature assumes paramount importance as applied to the use of gutta percha insulation for the tropics, and renders it wholly inadmissable, since, at a temperature of less than 80 deg., it becomes plastic and sticky; if, therefore, the conductor evinces a tendency to elbow its way through the insulation, the latter can offer no resistance in such a decomposed state. We have a lamentable and expensive illustration of this in the Rangoon cable, which could not withstand the temperature even of the ship's hold.

From a lengthened experience in India, devoted principally to telegraphic development there (in which it is but just to say he has been eminently successful, and earned the nation's gratitude), Sir W. Brooke had abundant proof of the total unfitness of gutta percha. Acting, therefore, upon the experience thus acquired, Sir W. Brooke, on his arrival from India, some twelve months' since, induced the Indian Board to order a caoutchouc core for the preliminary short cable of twenty miles, intended for some narrow part of the Persian Gulf; and the results of the testing of this cable demonstrate the wisdom of the choice, and that his successors, as telegraph engineers to the Indian Council, cannot possibly do better than tread in the footsteps of their predecessor in this respect. In fact, they must do so; the force of circumstances will compel them, unless, indeed, another series of gigantic failures is to be added to the disastrous shams which have already become a matter of history, certainly not to our credit as a nation of pains-taking and practical men.

At a temperature where gutta percha becomes a soft, resistless pulp, india-rubber retains its solidity intact, offering the test of guarantees for the cetricity of the conductor—a position of affairs, by the way, of the greatest moment to a submarine cable. It may, therefore, be unhesitatingly affirmed, that caoutchouc is the only material that can be successfully used as an insulator for cables intended for our Indian Empire, or any locality contiguous thereto.

A combination of the two gums, however, having been put prominently forward as being a far superior method of insulation than either percha or caoutchouc, singly, it becomes us to bestow some little consideration thereupon. The conductor, it appears, is to be first insulated with rubber to a certain thickness, because it is, perforce, the better insulator admitting of less induction; and then a series of coatings of percha, by way of protection, are to be added, to bring the core up to the required diameter; and the reason assigned for this singular species of manufacture is, that caoutchouc decomposes rapidly in sea water. Doubtless, in a long course of years, the action of sea water upon a cable would be to decompose the whole concern, however it might be constructed; but it is with reasonable periods we have to do, and certainly those persons who propose gutta pecha, or any other material as preventatives of the decay of caoutchouc, must adduce other and more cogent reasons than those which time and experience fail to verify. I can speak confidently, and from experience, when I assert that years of submersion in sea water, not only does not decompose rubber, but on the contrary hardens it, and improves the insulation. Sufficient consanguinity is not found to exist between the two gums to ensure that adhesive homogeneity in the entire core which is of such essential importance. It is evident, therefore, that this description of insulation will not do for the Persian Gulf cable, and is by no means to be recommended for any other, seeing also, that its electrical qualities will ever be far below the standard required.

To sum up, therefore, we want efficient telegraphic communication between every important part, near and remote, of our vast Indian Empire, and these again in immediate connection with the seat of Government at home; it is necessary, if this is done at all, that it should be done well, and as perfectly as the experience already acquired will admit of, and this points unmistakeably to caoutchouc as the prime insulating agent for this purpose. PHILO.

OBSERVATIONS ON THE SHOEBURYNESS EXPERIMENTS WITH WHITWORTH'S SHELLS.

SIR,—In my last letter containing some remarks on "Civilian's" communications, I was led to observe that if iron armour on our vessels was of sufficient thickness to keep out shells, that would be the limit of utility, and that wood would better provide for what further defence might be deemed requisite; but really it would seem by last week's experiments that we are to be deprived even of this immunity, in regard at least to any thickness of plates which sea-going ships could carry. I confess that this result surprises me in regard to shells, although capped with steel, but not so in regard to shot; for I anticipated the great superiority of steel for projectiles in your number for December, 1858, when I made these remarks:—"That the species and phenomena of force cannot be limited to what is observable of momentum alone: that a blow, to be viewed practically, must be seen in two aspects, as the result of, and measurable by, momentum, and as the result of and measurable by *vis viva*: that it is in the latter aspect crushing effects must be contemplated: that it will depend on *practical circumstances*, such as the comparative *hardness* of the conflicting materials, on the velocity being the prominent factor in the *vis viva* of the shot, and on the particular angle at which it strikes, whether it shall freely glance from, crushingly graze, or more crushingly lodge in, or penetrate through, the iron casing of a ship: and that the great enemy these ships will have to contend with is, the rifled cannon with *steel* shot."

All these observations have a bearing on the recent experiments, but I can refer now to only two. It will be observed that I make the penetrative efficiency of shot to depend, not merely on comparative hardness, but on the prominency of the factor velocity, (equal amounts of *vis viva* being understood), that is to say, while I acknowledge with Sir William Armstrong that the real power of shot is proportional to the mass and the square of the velocity, I do not believe that, *cæteris paribus*, penetrative effects are proportional thereto at very high velocities, but that resistance decreases in the case of some materials and some forms of the action in an unknown ratio with the time permitting resistance. There are many phenomena which, to my mind, are inexplicable, except on such an hypothesis, and these Shoeburyness experiments confirm me in the idea. I do not believe that the real law of resistauce against penetration is known, although the mathematical conception of it may approximate nearly to it within the range of moderate velocities. There may not be much deviation in the case of wood within these limits, and possibly not within any practical velocities (which would be a valuable property to ascertain); but I strongly suspect the mathematical law in the case of iron, especially when a hole made in it is the result of a piece being driven out. We know that the resistance which is so exceedingly regular in the compression of gases within a certain range, and even beyond it to some extent, if we allow time to operate, becomes very irregular as we approach the limit of liquefaction, and similar irregularities may belong to the disparting as to the compression of the molecular forces.

Now this hypothesis furnishes me with this corollary in regard to the matter in hand, that we could pierce armour plates equally well with wrought or cast iron, as with steel projectiles, if we only had the means to give them that high degree of velocity at which the resistance against separation in the plate is less than against compression in the shot. As the effect depends on velocity as well as on the comparative hardness of materials, it will stand in relation to both, leading thus to changes variable, and sometimes paradoxical, according to ordinary apprehension. Thus, a candle, with the velocity for the case, will perforate a board; and an electric spark will punch a minute hole through two inches of solid glass—a proportion of depth to diameter somewhat exceeding the law laid down by "Civilian" for punching processes. It seems to me very probable, that velocities exist in relation to certain materials, in respect to which the suddenness of impact is such as to render null, practically speaking, all cohesive resistance; and where the only resistance encountered is that due to the inertia of the parts carried away. Is not this so, when a bullet cuts out a clear round hole in a pane of glass? And did not Mr. Whitworth's hexagonal shells make an hexagonal hole? the surrounding, parts, as I understand it, remaining intact. No doubt this sudden palsy, as it were, with which molecular forces are struck, is explainable on mechanical principles, but what I am now concerned about is simply the fact. With a penetrating force, increasing *cæteris paribus* with the square of the velocity, and a resisting force, decreasing in some manner with the velocity, we can well conceive that we may have arrived at a point where the efficiency of plate armour is diminishing at a very rapid ratio; and that no very great advance on the present velocities may be needed to render iron casing useless within any reasonable thickness. But on the same hypothesis, on the other hand, the tenacity of the material for cannon, under the condition of great velocities being generated, would also be rapidly approaching the limit of safety; and, in truth, the frequency of their bursting on any mode of construction—although fired with much less charges than formerly obtained, and simply because the obstruction produced by rifling has been the means of eliciting a larger proportion than heretofore of the potential force existing in gunpowder—is a circumstance that goes far to confirm my hypothesis.

It is possible, therefore, that we have already got very near to the length of our tether, both for offence and defence.

I think that the flat ends of Mr. Whitworth's shells have little to do with the perforating effect. Flat ends produce more immediately the shearing strain to cut a piece out of the plate, but the round end will do the same, by quickly and virtually forming for itself a flat end out of the plate. This, at least, is always the case when a piece is punched out, and a round shot will do that when the plate is thick, and is struck with great velocity. The effectiveness of Mr. Whitworth's projectiles appears to me to be due, partly to the superior velocity arising out of his admirable method of rifling, and partly to the greater cohesion of his material—steel—by which all the work, virtual in that velocity, is done wholly on the plate, and not at all on the projectile itself. When a shot is shattered into fragments, there is a partial reversal of the action, and a waste, more or less, or, it may be, entirely, of all our efforts as to one mode of destructiveness. It is true the power of the projectile is wholly expended on the plate, in the effect, momentum; but if the plate is not indented, it is also wholly expended on the shot, in the effect, work; the manner thereof being a crushing of the missile. Nor is this a paradox; for these effects, though they both occur, and both flow from the same more remote cause, are not cumulative in relation thereto, but successive by successive origination. But if the plate is indented, then the work done is between the shot and plate. Now, the effect, momentum, we care nothing about, except for the crash that may possibly be the result; but the effect, work, is sought te be wholly done on the plate; and steel projectiles give us the means of thus wholly utilising the power which has been so long in our hands without turning it properly to account. Hitherto we have been losing projectile efficiency, by allowing the shot to absorb so large a portion of it. Perhaps, in some of the testing trials, the shot should have come in for praise or blame, instead of the plates. Four years have nearly passed away since the use of steel for shot was recommended in your pages.

But what is to be done now in the way of defence? I scarcely know how to give even a tolerable answer to this question; and begin to fancy that now I am indeed in the position "Civilian" assigns to me, of a maladroit doctor called into a consultation, who, scorning a *placebo*, replies to his *confreres* about the man dying, if nothing is done for him, that it is a truism, and that his own truism is, "all men are mortal." However, here is my nostrum. We must make our armour plates of steel, and with just that proportion of carbon which gives the greatest toughness and hardness without brittleness, so as to offer the best security against a piece being punched out of the plate, and to insure a strain, circumjacently and extensively, upon the contiguous parts. We must get far away from the glass type of resistance. We must thoroughly anneal the steel, but carefully avoid any great heat in this process, so as not to undo the toughness which the previous manipulations had imparted to the metal. The pinch of the rollers must be enormous, especially for thick plates, so that the compression may be felt to the core, otherwise internal strains will exist. Or the plates must be hammered with hammers of great weight and little velocity; we must have the metal in that state, if possible, that when pierced, it shall bulge and open with a burr without loss of substance, even under the greatest velocity that we can get guns to impart to shot. To this end also, and to extend the area of the strain, we must allow the plates to bend to the blow, as much as is compatible with the security of the fastenings (if fastenings cannot be dispensed with), and not back them up with a network of stiff iron framing, which would only facilitate the punching process, after the manner of dies, for all the interspaces. By-the-bye, this snapping of the fastening bolts, presents another illustration of my hypothesis. Now the elasticity of wood backing allows this moderate bending of the plates in a very convenient manner. Having placed steel plates upon a layer of wood, we must next add, over all, a casing of bronze, that is, of gun-metal plates, the edges of which must be fused together, in the manner of making junctions of the parts of a bronze statue. In this way we cut the knot of the difficulty about plate fastenings, for there need not of necessity be any. The great danger the "Warrior" will run, will be to have her plates knocked off by a pounding of heavy shot. My idea as to the further advantage of a bronze casing, is this, that the shot, impinging first on the gun-metal, would have its velocity so reduced, as to nullify the danger of a punching action, peculiar to impact with high velocities on the harder steel plates; and that it would be forced to do its work against a lacerating, disparting kind of resistance, to which the strength of surrounding parts would be rendered tributary. I repeat this idea, because I would not be understood to say that otherwise, that is in the case of uniform resistance, it would make any difference whether the one or the other metal was pierced first. There is another circumstance to be noticed in favour of this double casing; a flat-headed, tempered steel shot, would carry before it a flat plate of gun-metal, a little larger, perhaps, than itself, and compress it against the steel plate, and thus the advantage of superior hardness in the shot would be nullified by the intervening softer metal, which would have to be crushed in a confined chamber, as it were, until it was wholly squeezed out of the way, before the harder metals could come into contact. I think that here the round-headed shot would have the advantage; but with respect to either, the retardation would be immense. It would be the same case, virtually, as that of the work done, and lost in the crushing of the shot. I do not recommend steel plates in order to countervail tempered steel shot, for that would be a vain expectation, but to inflict such crushing work upon all other kinds of shot, and to condense into the same weight of plates a greater power of resistance than what resides in iron. Steel plates under this arrangement, need not be large, and would not, therefore, be much more expensive than the present immense iron plates, taking weight for weight; and probably they would be less costly for equal resistances. The proportions for the defence might be these:—gun-metal, 2½ in., steel, 3½ in., wood, 18 in., ship's skin, 0. As I must not now encroach further upon your space, I shall only observe, that the expansion of the gun-metal casing with heat has not escaped my notice.

Bnt it will be said that the expense would be enormous, because of the high value of gun-metal. Yes; war is a costly game to play at, and such it always ought to be. Money is a precious commodity; but life, the life of a nation, is infinitely more more precious.

Yours, &c.,

Nov. 17. BENJ. CHEVERTON.

P.S. There were some typographical errors in my last communication, the principal of which were these:—"Destruction," for obstruction; "*repousse* worked," for *repousse* work; and "6," for 9.

Meetings for the Week.

MONDAY.—SOCIETY OF ENGINEERS.—"On the Inundation of Marsh Land," by B. Latham, Esq., at 7 p.m.
LONDON INSTITUTE.—"On the Class Reptilia," by R. Owen, Esq., at 7 p.m.
TUESDAY.—INSTITUTE CIVIL ENGINEERS.—"On some of the Internal Disturbing Forces of Locomotive Engines," by Mr. A. W. Makinson, at 8 p.m.
WEDNESDAY.—LONDON INSTITUTE.—"On the Operation of Heat," by E. W. Brayley, Esq., at 7 p.m.
SOCIETY OF ARTS.—"On Thompson's Process of Boat Building by Machinery," by D. Puseley, Esq., illustrated by models, at 8 p.m.
FRIDAY.—LONDON INSTITUTE.—"On the Chemistry of the Non-Metallic Elements," by F. Field, Esq., F.R.S.E., at 7 p.m.

Gossip.

In our volume for 1859, page 43, there is an interesting account, by Mr. D. J. Fitzgerald, on the application of the hygroscopic properties of chloride of calcium to the drying of buildings, linen, tobacco, &c. In the western annex of the International Exhibition, we noticed that the surfaces of Krupp's samples of steel, broken by the hammer, and kept under glass cases, were in a singularly bright and untarnished state. On examination we found that this was owing to the presence of chloride of calcium; a saucer containing some of this deliquescent salt being placed in every glass case.

Maizena, or corn flour, has become an article of food of importance. The flour is made from the white or pearl corn of the middle states of America, and is manufactured by the Glen Cove Company, of New York. It has been introduced into this country by Mr. W. J. Townsend, and at the Exhibition it received a medal. The corn from which maizena is manufactured is raised in a climate where the summers are long, and of a temperature that ripens the grain to a state of perfection not attainable in colder or warmer countries.

The stage machinery of the new Vienna Opera-house is to be worked by a steam engine of eight-horse power.

A distinguished physician in Paris, Dr. Robert De Lambelle, announces that a shock of electricity given a patient dying from the effects of chloroform, immediately counteracts its influence and restores the sufferer to life.

An extraordinary meeting of the shareholders of the Atlantic Telegraph Company, will be held at the London Tavern, on Friday, the 12th of Dec., for the purpose of considering a proposition for the issue of £600,000 new capital in preferential shares of £5 each.

Mr. Gisborne, late commissioner for Newfoundland in the International Exhibition, has patented an invention of a system of ship's steering signals, and has received instructions from the Board of Admiralty to fit the apparatus in her Majesty's ship "Rhadamanthus," at Woolwhich. The apparatus consists of a couple of boxes, placed respectively on the bridge and in front of the helmsman, which are connected by means of a strong electric cable. On the face of each box are four metal flaps, under which are painted the words "port," "starboard," &c. These are worked by the simple touch of a knob or handle attached to the box, and the orders are replied to in a similar manner, without the slightest risk or danger of the order being misunderstood as at present, by means of the voice.

The *Saturday Review*, which is notorious for its universal genius in sneering at all animate beings and inanimate things, save and except Dr. Pusey and wax candles, has been guilty of some very amusing blunders, in treating on a subject of guns. Amongst other absurd assertions, it states, in an article entitled "Whitworth *v.* Armstrong," (a notice, by-the-by, in which both plaintiff and defendant are addressed in a very "Lord Chief Justice" sort of tone), that Sir William Armstrong has adopted and perfected the plan of building his guns of coiled metal forged into a solid mass. Mr. Whitworth professes to obtain greater strength by using a mass of homogeneous iron bound round with hoops of the same material. The confused ignorance displayed in these assertions, coupled with the arrogant line of the whole article, form a very *piquant* combination.

THE SMITHFIELD CLUB CATTLE SHOW.—On the 8th of next month, and the four following days, this show will be held at the new Agricultural Hall, at Islington. The building is, as yet, not quite completed. We understand that the *Building News* will give a full illustrated description of it next week. The building is 76 ft. high, and its galleries are 36 ft. wide. The heavy machinery will be placed under the galleries; the live stock in the open space of the main hall, the lighter exhibits being placed in the galleries. The award of prizes and private view will take place on Saturday the 6th, and the club dinner will take place on the 10th of December.

THE COLOUR OF SHIPS.—The deep black, says an American paper, which our ships have been painted, has proved to be a very prominent mark to shoot at, in consequence of which a change has been made to a greyish drab. The steamers "R. R. Cuyler" and "Ossipee," now at the Portsmouth Navy Yard, have been painted this shade, which makes them much more "invisible," so that one standing on one side of the river can hardly distinguish the vessels from the wharf or the water, whereas a small black boat and a schooner stood out in bold relief.

VENTILATING FANS.—Mr. Atkinson stated, at the last meeting of the Northern Institute of Mining Engineers, that within the last few days he had been trying some experiments with a fan of similar construction at Tursdale Colliery, near Durham, and gave some of the results arrived at. Mr. Atkinson also gave some account and description of the fan used by the Pneumatic Despatch Company in London, by which 14 inches of water pressure could be obtained. The principle appeared to him to be capable of being applied to the ventilation off mines with advantage. The fan consisted of two discs, and was about 20 feet in diameter, and made above 200 revolutions per minute. It was constructed so as to allow of this velocity being obtained, whilst the Elsecar fan could not with safety be driven above 70 revolutions per minute. By the Pneumatic Company's fan he obtained 30,000 cubic feet per minute through an opening of six square feet. The President stated that at first the company had considered it necessary to have the piston in the tube quite tight; they now, however, found that this was not necessary, and that little loss was caused by a space being left all round the piston. This materially reduced the friction.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the Proprietors of this Magazine. Other Papers are hereby warned not to produce them without an acknowledgement :—

STEAM ENGINES, &c., 1257, 1318.
BOILERS AND FURNACES, 1312.
ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 1277, 1300, 1307, 1313.
SHIPS AND BOATS, including their fittings, 1243, 1272, 1273, 1301.
CULTIVATION OF THE SOIL, including agricultural implements and machines, 1258, 1262, 1302.
FOOD AND BEVERAGES, including apparatus for preparing food for men and animals, 1242, 1252, 1253, 1263, 1275, 1291, 1295.
FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 1247, 1261, 1265, 1270, 1280, 1286. 1287, 1292, 1293, 1317, 1321, 1323.
BUILDINGS AND BUILDING MATERIALS, 1251, 1278, 1322.
LIGHTING, HEATING, AND VENTILATING, 1254, 1271, 1282, 1285.
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 1245, 1264, 1274, 1276, 1283, 1297, 1298, 1305, 1308, 1325.
METALS, including apparatus for their manufacture, 1260, 1269, 1294, 1314.
CHEMISTRY AND PHOTOGRAPHY, 1244, 1267.
ELECTRICAL APPARATUS, 1255, 1268, 1304.
WARFARE, 1266, 1281, 1290, 1303, 1319.
LETTER-PRESS PRINTING, *none*.
MISCELLANEOUS, 1240, 1241, 1246, 1248, 1249, 1250, 1259, 1279, 1284, 1288, 1289, 1296, 1299, 1306, 1309, 1310, 1311, 1315, 1316, 1320, 1324.

1240. G. B. GOODMAN. *Apparatus for preventing accidents in or at mine shafts.* Dated April 28, 1862.

This invention consists in an arrangement of machinery or apparatus which suspends the mine skip, or cage, if, by the breaking of the chain or otherwise, the said skip or cage becomes detached from the winding apparatus. *Patent abandoned.*

1241. J. BURNIE. *Improvements in tobacco pipes.* Dated April 28, 1862.

Under one modification the stem of the pipe, which may be formed of metal, wood, glass, or other suitable material, forms a moderately wide tube or cylindrical chamber. The lower part of this chamber has fitted to it, or is formed with, an internal tube, which extends a short distance up the pipe stem. The diameter of this internal tube corresponds to and is intended to receive the tube of the bowl, which is preferred to be made short. An ordinary mouthpiece is fitted into the upper end of the stem, and this is preferred to be made so that its tubular extremity extends a short distance down the stem. The bowl of the pipe is fitted with an internal moveable disc; this consists of a small perforated metal plate fitting the lower part of the bowl, and extending over the aperture through which the smoke is drawn. The disc is formed with a thin slip of metal, which is bent upwards and bent over the edge of the bowl to admit of its being lifted out, bringing with it the contents of the pipe. With these arrangements the tube of the bowl cannot get stopped by the ashes of the tobacco, whilst the only matters drawn out of the tobacco in smoking condense in the inner surface of the stem, and flow down into the space round the inner tube, which effectually prevents the return of the fluid to the bowl. *Patent abandoned.*

1242. J. FLETCHER. *Treating saccharine liquids.* Dated April 28, 1862.

The first part of this invention has for its object the superseding the use of open fire-heated boilers employed for boiling saccharine liquids, and consists in the arrangement and employment of an evaporating apparatus to perform the operation with greater advantage. The second part of the invention consists in an improved construction of apparatus for evaporating liquids, whether treated in the ordinary fire-heated boilers, or in the improved apparatus described for superseding the same. The third part of the invention consists in the construction of an improved cooling or granulating apparatus, in which the molasses of the sugar formed by the cooling of the liquid, treated in the preceding apparatus, is run off before the sugar is packed for transport. The fourth part of the invention consists in the construction of an apparatus, of comparatively small cost, in which the clarifying, evaporating, and granulating operations necessary for the manufacture of sugar from cane juice may be successively performed at option. *Patent abandoned.*

1243. R. VAILE. *Improvements in propellers for ships.* Dated April 28, 1862.

This invention relates to endless chain propellers, and consists in means for maintaining the floats attached to the chains in proper positions, and for driving the chains. The chains are passed round two or more drums or rollers. The drums are furnished with projecting rims or collars, having indentations to receive the chains; the drums may be placed either in a horizontal, vertical, or angular position. The floats are cut so as to receive the drum collars, and attached to the chains a little above, below, or in the centre. The floats work in grooved guides, and are furnished with projecting arms and friction rollers. They are feathered and prevented from getting into a wrong position by the action of the water, and by their arms coming in contact with guides. The upper part of the propeller works in a curve, and provision is made for hoisting the whole apparatus on deck in case of need. *Patent completed.*

1244. W. T. GLIDDON. *A new and useful mode of restoring phosphatic guano.* (A communication). Dated April 29, 1862.

The object of this invention is to resuscitate and restore phosphatic guanos to their original quality and effectiveness, and this is accomplished by reimpregnating them with such ammoniacal and alkaline salts as are a material aid in the luxuriant growth of the herbaceous part of the plants, and rendering a part of the basic phosphates soluble by converting them in one and the same process into bi-phosphates or super-phosphates. The reagents which have been selected for the above purpose are, first, all kinds of nitrogenous matter, such as carrion, of any description, fish, blood, or offal from slaughtered animals; in a word, any or all kinds of nitrogenous matter yielding ammonia may be employed. Secondly, Acids, preferring sulphuric acid. Thirdly, The fixed alkalies, such as soda and potash for instance. Fourthly, Sulphate of lime, or sulphates whose bases have less affinity for their acid than the nascent ammonia. *Patent completed.*

1245. G. R. SAMPSON. *Improvements in valves or cylinders for wind musical instruments.* Dated April 29, 1862.

This invention consists in a new and improved system of pistons or valves out of, and forming a portion of, the main and added tubing of each instrument, and is measured and calculated as a portion of the sounding part of the same. In this system of pistons or valves the air enters into them vertically at the top or bottom, or horizontally, in the middle, on one side of the piston, only coming out at the top or bottom, but never going through them from one side to the other, as in ordinary systems. The air passes through one of the pistons at all times, whether it is pressed down by means of a rod or not, and when the same is pressed down, it brings the added tubing into use; then the air passes through both ends of the pistons. *Patent completed.*

1246. H. F. WELLS. *Improvements in screw clamps or cramps for joiners and other work.* Dated April 29, 1862.

This invention consists in the use of a notched or plain bar of metal of any desired length, according to the purpose to which the cramp is to be applied, with one or more sliding arms formed in the manner described. When one arm only is used, the end of the bar is turned up to form an abutment or pressing surface, against which one side of the material to be clamped, cramped, or compressed, is placed. The sliding arm is self-fixing by its peculiar form, and when placed in the proper position upon the bar forms the other abutment. An adjusting screw, fitted either in the head of the bar, or in the end of the sliding arm, or in both, completes the cramp. In place of twining one end of the bar up, a plain bar, notched in opposite directions, and two sliding arms, may be added. The sliding arms are formed with a hole or slot at one end, through which the bar can be passed. The arms can thus be moved along the bar to any required position. *Patent completed.*

1247. J. W. and F. G. OALEY. *An improved textile fabric.* Dated April 29, 1862.

This invention, although more especially intended for window roller blinds, may be applied to other uses. The blind is of cotton, and manufactured with a semi-transparent pattern, that is to say, with figures or designs in gauze or open work, very similar to lace or net. Through this gauze or open work light penetrates more fully than through the ground or close part of the fabric, which, when used for a blind, has a very rich appearance, and which, while softening the light, diffuses more within the apartment than the ordinary even or patternless blind. The improved fabric is produced by the gauze or open works part having the threads in the warp twisted together according to the requirement of the pattern to be produced, and the plain or ground part of the threads in the warp rising and falling two threads up and one thread down alternately. *Patent completed.*

1248. J. E. A. GWYNNE. *Improvements in machinery for lifting, forcing, and exhausting, and in the application of the same.* Dated April 29, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1249. R. E. DIXON. *A smoker's pipe and tobacco pouch.* Dated April 29, 1862.

The distinguishing nature and character of this invention consists in arranging and fitting a small compact box or case for holding and protecting the pipe when not being used, and for keeping and carrying matches and other little articles of convenience for smokers, and in connecting and combining therewith a bag or pouch for keeping the tobacco for smoking, which, however, is entirely distinct from the pipe case, except when the pipe is to be filled, when communication is made between the two without opening or detaching either, and the pipe filled without the use of the hands or fingers to put the tobacco in the pipe. *Patent abandoned.*

1250. S. W. NEWINGTON. *Improvements in apparatus for letting off and stopping the flow of liquids from casks and vessels, such apparatus forming a tap, and substitute for the ordinary vent peg.* Dated April 29, 1862.

This invention consists in forming a tap and substitute for the ordinary vent peg, by having an ordinary tube or duct with an open or perforated end, to be inserted into the cask or other vessel of capacity. and also provided with a nozzle or outlet (though it is not a matter of necessity, as in ordinary taps, that the same should be provided with a stopper, neither does the patentee ordinarily use the same). The nozzle is provided with a flexible tube, which has a small tube at its end, whereby the liquid can be let off when required, or the flow thereof stopped, by simply inserting the same in the vent hole of barrel, cask, or vessel of capacity, thus stopping the vent hole and the flow of liquid by one and the same operation. Hence, by this arrangement, when letting off is in progress the vent hole is unstopped, and when the letting off is finished, the vent hole is to be stopped by the said tube. *Patent completed.*

1251. E. CLARK. *Improvements in arches.* (A communication.) Dated April 29, 1862.

This consists in the peculiar arrangement and construction of arches for bridges, roofs, and similar structures, more particularly when the openings to be arched are of considerable space. These arches are composed of bars, or plates, arranged in the form of a single or double series of triangles. *Patent completed.*

1252. W. CLARK. *Improvements in preserving animal and vegetable substances.* (A communication.) Dated April 29, 1862.

This relates to improvements in the preservation of all kinds of animal and vegetable substances, by the use of steam, or other method of producing a vacuum, whether the alimentary substances be used as human food or used for feeding animals. The methods of operation are of two kinds, according as the animal or vegetable substances are preserved, without being previously dried for that purpose. In order to preserve alimentary substances in their natural state, without being previously dessicated, the patentee uses air-tight reservoirs, surrounded on the exterior with impervious materials, such as india-rubber, gutta-percha, or other substances. These reservoirs are provided with doors, opening easily, and luted, so as to be perfectly air-tight when closed. Grapes, plums, pears, nuts, or eggs, may be preserved without providing a vacuum, it being only necessary to completely fill the reservoir, care being taken to fill the interstices with powdered charcoal, coke, schistons, or bituminous blak, or tissue paper. *Patent completed.*

1253. J. ROSS. *Improvements in grinding stones or surfaces for grinding grain and other substances.* (A communication.) Dated April 29, 1862.

This relates to conical grinding stones, which the patentee forms of pieces of stone, placed in a conical cast-iron shell, in which they are rigidly fixed. By this means a hollow conical grinding surface is cheaply and easily made, which is as efficient for the purposes of grinding as if made in one piece. He fixes the iron shell, with its stone lining, in suitable framework, as the bed or stationary stone of the mill, and mounts the solid conical running stone on a shaft, by which it is driven. *Patent completed.*

1254. R. BRIGHT. *Improvements in lamps and in apparatuses for lighting Argund and other wicked lamps.* Dated April 29, 1862.

This invention consists in employing in oil lamps a "bob" at the end of a cord, string. or wire, to indicate the perpindicularity or level. The invention also consists in admitting air into the reservoir in oil lamps through a bent tube in the face or fore-part of the lamp reservoir, whereby the lamp may be carried at various inclinations without spilling the oil. The apparatuses for lighting lamps consist of a lamp with two wick holders at such distance apart that they will embrace, or contain between them, the Argand or other circular wick, or the two ends of a straight wick, to be lighted, and in such manner as to light the wick on opposite sides or ends at the same time. *Patent abondoned.*

1255. J. CLIFF. *Improvements in insulators for supporting telegraph wires.* Dated April 29, 1862.

This invention consists in constructing what the inventor terms a compound insulator, as hereafter described :— The compound insulator consists of two parts; the outer part is formed with a notch in the top for the reception of the telegraph wire; the other part consists of a shaft carrying near the bottom thereof a disc, the diameter of which is nearly equal to that of the inside of the mouth of the outer part; the bottom of the shaft has a hole formed in it for the reception of the pin, or stud, by which it is connected to a post or other support. The head of the shaft is intended to be lodged in a recess formed in the inner and lower part of the body of the outer part, in order that the two parts may be united to form the compound insulator by means of sulphur or other suitable insulating cement. Care must be taken that the shaft and upper part shall in no part be in contact, therefore the size of the recess must be large compared with the size of the head of the shaft. In order to prevent wet or moisture injuriously affecting the insulator, he applies a coating of shellac into the upper angle or head inside the outer part. The recess into which the head of the shaft is inserted is enlarged at the bottom, and for further security against damp or wet affecting the insulator, the inner surface of this bottom part may be coated with shellac, or the space between it and the spindle may be filled with that material. *Patent abandoned.*

1256. W. L. TIZARD. *Improvements in heating, cooling, and condensing apparatuses.* Dated April 29, 1862.

This invention was described and illustrated at page 330 of the present volume of this journal. *Patent completed.*

1257. D. M. CHILDS. *Improvements in steam engines.* (A communication.) Dated April 29, 1862.

This relates to the steam chest and valves. The steam passes through a pipe and enters a steam space which surrounds the valve; the port being in communication with a branch passage, conducts the steam to the cylinder port, and, acting upon the inner head of the piston, forces the same forward, and by causing the fly-wheel to revolve, operates the connecting-rod, which is attached to the valve-lever. The exhaust escapes through the cylinder port, the passage, and escape pipe, which are thus brought in connection, and the valve-lever being operated by the connecting-rod, causes one-fourth turn or revolution of the valve, and brings the ports in connection with the branch passage, and thereby opens the exhaust; the supply port being in communication with the passage, admits the steam through the passage and cylinder port to the outer surface of the piston head. The patentee uses the throttle of a double-acting engine to reverse the engine. *Patent completed.*

1258. D. M. CHILDS. *Improvements in reaping and mowing machines.* (A communication.) Dated April 29, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1259. D. M. CHILDS. *Improvements in the means of changing a rotary into a reciprocating, and a reciprocating*

into a rotary movement in machinery. (A communication.) Dated April 29, 1862.

In carrying out this invention there is a slot in the device or frame as long as the stroke or motion required, and through which the shaft is designed to travel or pass, and there are grooves crossing the centre of the slot at right angles with the same. The groove is designed to receive a slide which operates upon a crank wrist. *Patent completed.*

1260. E. B. WILSON. *An improvement in the machinery or apparatus used in the manufacture of malleable iron and steel.* Dated April 29, 1862.

This consists in placing the tuyere or tuyers of the converting vessel (which is suspended on axles) above the molten vessel, and in blowing down upon or through the metal, in place of blowing up through the same as heretofore. *Patent completed.*

1261. W. E. NEWTON. *Improvements in machinery for picking, burring, and cleaning wool and other fibrous substances.* (A communication.) Dated April 29, 1862.

We cannot here give space to the details of this invention. *Patent completed.*

1262. W. E. NEWTON. *Improvements in the construction of mowing and reaping machines.* (A communication.) Dated April 29, 1862.

The patentee claims enclosing the whole or portion of the driving parts of reaping or mowing machines in a case or box, as described, for protecting such parts from injury from the weather or from other causes, and the mode shown and described of carrying forward the stalks of cut corn, so as to form a continuous swath when they have been cut. *Patent completed.*

1263. M. HENRY. *Improvements in apparatus for ærating liquids, and in fastenings for the said apparatus, and for other articles.* (A communication.) Dated April 29, 1862.

Here the mount or cover of the vessel is placed on a ring or collar, formed or fixed on the neck of the vessel, and has hinged or jointed to it two bent, curved, or arched arms, links, or pieces, to which are hinged or jointed other arms, which may be described as levers, and which, when depressed, are brought into such position that portions of them are caused to bear against or take into the under surface of the ring or collar, by which the mount is securely fastened on the vessel; it is disengaged therefrom by raising the jointed arms and thereby moving them from or causidg them to clear the ring or collar. The inventor employs a tube, divided so as to form two distinct passages, or fluid ways, one of which is for admitting liquid to the powders in order to generate the gas, and the other is for the exit of the ærated liquid from the apparatus. The apparatus for the æration of liquids consists of two chambers or compartments, one (the upper) for containing the liquid, and the lower for holding the powders; and the tube is applied to this apparatus so that the inlet way shall lead at bottom into the lower or powder chamber, and shall open at top into the upper or liquid chamber, at a height regulated according to the quantity of liquid required to be injected on the powders for generating the gas. *Patent completed.*

1264. E. MOORE, *Improvements in the manufacture of dress shirts and dresses.* Dated April 30, 1862.

Here, instead of using materials of the ordinary texile nature, consisting of weft and woof, the patentee makes or weaves the dress shirts and dresses, manufactured in accordance with this invention, entirely with a continuous thread in stocking frames by the process known as framework knitting, so that they shall possess the qualities and advantages of that manufacture, especially its elasticity, in every direction of the fabric, and its consequent durability. The articles are woven in the frame in parts from a cut pattern, such parts being combined in the frame by the process known to framework knitters as "hanging on" or "picking on," and the articles being then completed by weaving on in the ordinary way practised in the manufacture of articles of hosiery. *Patent completed.*

1265. A. TRAVIS and B. TRAVIS. *Improvements in engines for carding cotton and other fibrous materials.* Dated April 30, 1862.

This consists in an eccentric or crank pin fixed in or formed upon a pulley, which is free to rotate upon a stud fixed in a bracket from the framing of the engine. This pulley is driven by a belt or band from the axis of the main end cylinder, or any other convenient rotating part of the engine. The eccentric or crank is arranged to work in a space formed lengthwise in an arm or lever secured to the end of the shaft passing in front of the doffer, which shaft carries the doffer comb. The stud upon which the pulley eccentric or crank is placed is adjustable, so that it can be brought nearer to or further from the comb shaft, and thus two oscillating movements, produced by the rotation of the eccentric or crank, can be made of greater or less extent, as required. *Patent completed.*

1266. A. J. MAHON. *Improvements in projectiles.* Dated April 30, 1862.

This improved projectile is in the form of a bolt, and may be of any suitable shape at the front end, either conical, hemispherical, or otherwise, but the rear or cylindrical portion of the projectile is grooved, rifled, or cut in planes at any desired angle internally, externally, or both, and provided or not with apertures round the cylindrical band under the solid front of the propeller, or along the grooves, so that the gas generated by the explosion of the charge may be forced through the apertures, and impart a twist or spinning motion to the projectile in the barrel, such projectile scarcely touching the sides of the same. *Patent abandoned.*

1267. J. HARRINGTON and T. PERKINS. *An improvement or improvements in mounting photographic portraits for visiting cards, and in mounting photographs in general.* Dated April 30, 1862.

This consists in making a depression in that part of the card at which the photograph is to be mounted, the said depression being of the size and shape of the photograph, and constituting a sunk recess in which the photograph is placed and secured by gelatine or other adhesive material. *Patent abandoned.*

1268. G. DAVIES. *An electric apparatus applicable to various useful purposes.* (A communication.) Dated April 30, 1862.

This consists in the application of electric apparatus or gearing to various useful purposes. 1. To the working of breaks, signals, and other apparatus on railways. 2. To feeding steam boilers, and to water-gauges, pressure-gauges, and safety-valves. 3. To regulating the temperature of gas, and of hot or cold air and fluids in general. These results are obtained by the action of an electric pile, with optional intermittent contact, acting either manually or automatically upon appropriate gearing or apparatus. *Patent completed.*

1269. G. DAVIES. *Improvements in the manufacture of nails, screws, and other analogous articles in malleable cast iron.* (A communication.) Dated April 30, 1862.

The patentee claims the substitution of malleable cast iron for wrought iron in the manufacture of nails for stove making and other purposes, and of various small articles of ironmongery, which may be either covered with a coating of another metal or not, as described. *Patent completed.*

1270. A. T. MERCIER. *Improvements in weaving looms.* Dated April 30, 1862.

These improvements apply principally to the following parts:—1. The lifting of the boxes by the cording or tie-up, by squares communicating by metal rods with other squares which lift the shuttle boxes. 2. Metal racks, the teeth or notches of which uphold the boxes at their different heights by cramps or pawls in connection with the carding. 3. Notches, flats, or plates pressed by a spring against the two fingers or branches of a lever tied to the cordage by a cord, which, raising the lever, cause the pawl to leave the notch of the rack, and permits the box to change its position. 4. A rack provided with two fingers, which, finding themselves placed before one or other driver, permits one or other of the shuttles to throw according to the requirements of the design to be produced. This rack is set in motion right or left by a pinion which toothes into it, and fixed on a shaft, at the end of which is also fixed a crescent, the two ends of which are fastened by cord to the lifting wires of the cordage. *Patent abandoned.*

1271. J. MAIDEN. *Improvements in safety lamps.* Dated April 30, 1862.

This consists in adapting to the ordinary Davy lamp certain springs, catches, and other contrivances, whereby the lamp is rendered both self-locking and self-extinguishing. *Patent completed.*

1272. E. LEIGH. *Improvements in the construction of ships and floating batteries, in mounting their guns, and in the application of steam power, part of which improvements are also applicable to land batteries and forts.* Dated April 30, 1862.

Here the inventor makes the paddle-wheel propellers work between pontoons astern, the propeller being made with shrouds and buckets similar to a water-wheel, the buckets being air tight, or partially so, the edge of each float being set a little zigzag. When they enter the water the air within them is compressed, and serves to keep the water towards the periphery of the floats; as the floats leave the water the air rushes out, and pushes the water away from them, the recoil acting in the direction of propulsion. In other respects the paddles are detached and acted upon, and acted upon for steering purposes if required. For destroying an enemy's ship the inventor arranges a cylinder and piston (upon the principle of the steam hammer), whereby a prodigious blow can be delivered. In mounting ships' guns he balances two guns at the end of a lever, which works on a pivot. The said guns, when at rest, are below the port-holes, and lie in a horizontal position. *Patent abandoned.*

1273. T. PIATTI. *Improvements in the propulsion of ships and other vessels, and in the means and apparatus employed for this purpose.* Dated April 30, 1862.

Here propellers are mounted upon the ends of the main driving axis, or shaft, on each side of the vessel, like the ordinary paddle-wheels, and the apparatus consists of two wheels, circles, or frames, which are keyed or fixed at a suitable distance apart upon the main axis near the sides of the vessel. These wheels, or circles, are connected together by studs, or bolts, and are formed with three arms or projections, through which other studs, or bolts, are passed, and upon which the propeller blades, or oars, are mounted, serving as axes upon which they can swing or move freely. The axis on which each propeller blade, oar, or paddle is mounted (and upon which it is capable of making a partial revolution), is placed near its centre; and as the end of each paddle enters and passes through the water to propel the vessel, the opposite end is borne against one of the studs, or bolts, which connect the two circles, or frames, together. Near the outer extremity of each blade, or paddle, friction rollers are carried, which enter into or between circular grooves, or guides, fixed on the sides of the vessel, and fixed in a position eccentric to the main driving axis, so as to govern the relative positions of the propeller blades during their revolution. *Patent abandoned.*

1274. H. HICKMAN. *The more securely fastening of ladies' crinoline skirts and other articles of wearing apparel, and also for the fastening of elastic and other bands.* Dated April 30, 1862.

This consists in the use of a perforated piece of metal, made in such shape or form as is required in the making of ladies' crinoline and other skirts, dresses, and articles of wearing apparel; also for the more securely fastening elastic and other bands. Being perforated, the piece of metal becomes, when applied to tapes, wires, or other substances, immovable, consequently more durable than any now in use. *Patent abandoned.*

1275. J. OXLEY. *Improvements in apparatus for cutting and chopping bread and other substances.* Dated April 30, 1862.

This consists, essentially, in the use of a knife which is connected at each end to a lever, vibrating on a centre, on the table or base of the apparatus, so as to impart a draw cut to the knife. *Patent completed.*

1276. G. H. BIRKBECK. *Improvements in the construction of couches or settees for the purpose of sitting, lying, or reclining upon.* (A communication.) Dated April 30, 1862.

Here the permanent seat of the couch or settee consists of an elastic surface, formed by springs, or stuffed with elastic materials, and beneath this surface a drawer or receptacle is formed, which is carried by the framework (mounted on castors), which supports and forms the couch or settee. To one side of the bottom or supporting frame another frame is joined or hinged, so as to form, when raised and fixed in an inclined position, an elastic surface or back to the couch, to rest or recline against. The front of this hinged frame has a loose or elastic cloth or cover attached thereto, and is stuffed with suitable soft or elastic material to form the bed when the frame is moved down into a horizontal position, so as to rest and be supported upon the spring or elastic surface of the couch or settee. There are other details. *Patent abandoned.*

1277.—J. M. CARTER. *Improvements in harness and the shafts of carriages.* Dated April 30, 1862.

This invention is not described apart from the drawings. The patentee claims, 1, the attachment of the ends or points of the shafts to the frame or other receptacle fastened on to the collar or other breast part, as also the method set forth for regulating the length of the shaft. 2. Dividing a portion of the shaft lengthways, and having an opening in the same for admitting the tug. 3. The attachment of the surcingale to the under part of the tug. If a bar within the terrett with an opening, or a terrett which has an opening, and the height of the interior of which, or that part intended for the reins, is less than the width of the reins. 4. A receptacle for that portion of the shaft straps, which support the traces in double harness, which is surplus caused by the action of the horse. *Patent completed.*

1278. A. PRINCE. *A new composition for casting to represent marble.* (A communication.) Dated April 30, 1862.

The patentee claims the composition formed of minerals and waterglass, or silicate of soda, or potash, or both, substantially in the manner specified, constituting a substitute for gypsum and marble, for the purpose of casting copies of figures, busts, relievos, and articles of sculpture of every kind, &c. *Patent completed.*

1279. W. STAUFEN. *A new material to be used in the manufacture of brushes, and also applicable to the purposes for which bristles, horsehair, and human hair, are now used.* Dated April 30, 1862.

Here the patentee takes the fibres of the tree known to botanists as the *Arenga Saccharifera*, and treats them with a hot alkaline solution, in order to remove the resinous matter, after which the fibres are dyed, dried, and sorted into suitable lengths and thicknesses. *Patent completed.*

1280. J. L. NORTON. *Improvements in apparatus for drying fibrous materials and yarns.* Dated April 30, 1862.

Here the patentee uses a drum, which, at its periphery, has fixed to it or receives a number of cases or boxes, arranged in a circle or polygon around the drum. The boxes or cases are each perforated at the top and bottom, and within the circle enclosed by them there is a fan, which is caused to rotate rapidly and produce a current of air through the boxes; the drum, with its boxes, also rotate, but at a comparatively low speed, so as to turn over the fabrics or yarns, and keep them in motion, so that the current of air may act on every part. *Patent completed.*

1281. J. M. NAPIER. *Improvements in machinery for manufacturing projectiles.* Dated April 30, 1862.

Here the patentee, in the compressing machine, uses a first or weighing die, which partially forms the blank after it is cut from the lead rod, and, at the same time, the surplus lead is forced through an aperture in the die, and is cut away, so that the exact quantity of lead required to fit the second or finishing die is left, and when the finishing impression is given, there is no surplus lead to be detached from the bullet. *Patent completed.*

1282. A. H. FIELDEN. *Improvements in show jars, lamps, signals, and light-houses, and other methods of illumination to be called the "rainbow light."* Dated April 30, 1862.

This consists in the introduction into show glasses, of glass rods or tubes, bent or straight, either white or coloured, so disposed as to allow of the tubes being illuminated. The same principal the patentee adopts in signals, lamps, light-houses, &c. *Patent completed.*

1283. H. F. BROADWOOD. *Improvements in the construction of pianofortes.* Dated April 30, 1862.

This invention is not described apart from the drawings. The patentee claims, 1. The invention of screwed wrest-pins into plated wrest-planks, in the manner and for the purpose described. 2. Forming metallic pin plates of a bent or compressed shape as described. 3. The mode described of fixing and retaining wooden pin plugs in their places by compressing the plugs before driving, and by forming notches or irregularities in the holes. *Patent completed.*

1284. H. WILLIS. *Improvements in valves for the supply and discharge of gaseous bodies.* Dated April 30, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1285. W. E. NEWTON. *Improvements in lamps.* (A communication.) Dated April 30, 1862.

This relates to a mode of securing the chimney to the cone, and of securing the cone to the burner, whereby the chimney is allowed to expand as it heats, and is thereby prevented from breaking. The invention also admits of the cone being firmly secured to the burner, and serving as a handle, to allow of the chimney and cone being removed from the burner while hot, so that the wick tube may be exposed, and the wick trimmed easily at any time. *Patent completed.*

1286. W. T. LOY. *Improved machinery or apparatus for carding cotton and other fibrous substances of a similar character.* (A communication.) Dated April 30, 1862.

This consists in altering the position of the "workers" and "strippers," whereby the patentee is enabled to purify the cotton in a complete, easy, and economical manner. *Patent completed.*

1287. J. Swallow and J. Allinson. *Improvements in the manufacture of carpet fabric.* Dated May 1, 1862.

This relates to the production of a novel description of carpet fabric, obtained by peculiar weaving of the character of tweeled venetian, in which the warp threads are brought to the surface in pattern without break of tweel. *Patent completed.*

1288. W. B. Smith and W. Bennetts. *Improvements in the method of and apparatus for preventing the injurious effects occasioned by smoke, sulphur, and the deleterious gases which escape from stacks, chimneys, calcining houses, chemical and other furnaces.* Dated May 1, 1862.

Here the flue, which is conducted from the back of the fire, must be carried on to a small case, in which is a blast fan, from whence the flue must be continued to a chamber, or, if need be, to a succession of chambers. When the blast fan is made to revolve rapidly, it causes a draft in the flue, which can be regulated as desired, and which carries onward the smoke and the gases evolved during combustion, and the air which passes into the fire and discharges when into a chamber or a succession of chambers, where they are treated according to their nature, no air being allowed to escape but that which is harmless, and this is passed through a finely perforated metallic plate, or through a sheet of canvas, which is affixed to the outlet from the chamber into which they are discharged. *Patent abandoned.*

1289. C. P. A. Douchain. *Improvements in apparatus for letting in or shutting off water or other liquids.* Dated May 1. 1862.

This consists in the construction of a sump cock, which may be visited and repaired without removal from the conduit or pipe to which it is fitted. For this purpose, the cast-iron sump, which is conical, carries two hollow dovetailed fillets, in each of which dovetail a leather washer or guage corresponding with the cock, and fixed simply by the dilitation of the leather, which is placed on its thickness when wet, a little ammonia being added when necessary to fix the oxydation. This leather, thus held on the sump, rubs against two surfaces, in brass or bronze, of a cone forming one body with the cast-iron cock, having previously been turned with it, and imprisoned by a hydraulic press and conical mandril. Thus the cock is of one piece, which lessens the chance of leakage; and in case of accident to the leather washers, they may be rapidly replaced by taking the upper part of the cock to pieces, lifting out the sump, cutting the old washers into two or three pieces to permit their withdrawal, and substituting new ones, which are all turned of the same calibre or guage. This arrangement is also applicable to all kinds of cocks. *Patent completed.*

1290. T. Holmes. *An improvement in the manufacture of military cartouches, port-monaies, courier bags, letter bags, knapsacks, and other articles of a like nature.* Dated May 1, 1862.

This consists in the insertion of a steel wire spring at the bottom of the cartouch, port-monaie, courier bag, &c., with arms extending up the back and front of the cartouch, port-monaie, &c., which act so as to insure the perfect satety of the contents of the several articles above named. *Patent abandoned.*

1291. W. Huntington and T. Huntington. *Improvements in the machinery for the manufacture of bread.* Dated May 2, 1862.

Here, the yeast and other required materials are put into long narrow troughs, which troughs are placed one at a time on a platform, which has imparted to it a reciprocating motion below a pair of rotating transverse shafts which project over the edge of the shaft at each side. The shafts are fitted with specially constructed arms or heads for kneading the dough, and when in motion, the shafts revolve in opposite directions. A large hopper is provided (above the frame) and arranged to supply the flour gradually and regularly. There are other details for manipulating the dough, in order to form it into loaves. *Patent completed.*

1292. H. Kohn. *Making any kind of stuffs, textures, or fabrics waterproof.* Dated May 2, 1862.

This waterproofing composition is composed of 1-16th of an ounce of bone flour, the white of an egg, 1-16th of an ounce of salt alkali, and dissolves the whole in a quart of pure water. *Patent abandoned.*

1293. W. Bodden and W. Mercer. *Improvements in certain parts of machinery for slubbing and roving cotton and other fibrous substances.* Dated May 2, 1862.

This relates to slubbing and roving frames, and consists in certain modes of connecting the pressers to the legs of the flyers, by which the slubbings and rovings are wound on the bobbins. *Patent completed.*

1294. T. F. Griffiths. *An improvement or improvements in raising or shaping sheet iron.* Dated May 2, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1295. R. Walker. *Improvements in malting, and in apparatus therefor.* Dated May 2, 1862.

This improved apparatus consists of a cylindrical vessel divided into separate compartments, and formed with sides made of a permeable material. An external, close, or impermeable casing may be provided, to be applied or removed as required. The cylindrical vessel is mounted so that it can be turned by gearing, and so that the motion imparted can be varied or modified in any desirable way. Provision is made for applying heat to the vessel, either directly or by means of heated air, for example; and for this purpose the vessel may be enclosed in a chamber, so that the air current or the amount and proportions of other gases (which it is in contemplation in some cases to apply) may be easily regulated and controlled. In the case of several vessels being employed, the process may be arranged so as to be at different stages in different vessels, or in different sets of vessels at the same time, whereby considerable economy will be obtained. *Patent completed.*

1296. O. C. Evans. *A reversible attachment to a shaft or arbor for converting reciprocating rectilinear into rotary motion.* Dated May 2, 1862.

We cannot here give space to the voluminous details of this invention. *Patent abandoned.*

1297. O. C. Evans. *An abdominal truss intended for the more perfect support and cure of hernia.* Dated May 2, 1862.

This invention consists in making the truss with six instead of one or two pads, as in most instances of this class, two hernia, two iliac, and two lumbar. The hernial pads are connected one with the other by (what the inventor here terms) a pubic bar, which is a steel or iron bar extending from the one to the other, and which is made in two separate pieces, and united by a set screw in a manner so as to form a slide joint. And this in order to enable the wearer as well as operator to adjust the pads at will to the width of the pelvis and position of the hernial ring or rings. *Patent abandoned.*

1298. C. Ashwell. *An improved safety fastening, applicable to the locks of doors.* Dated May 2, 1862.

This invention consists in a piece of mechanism of the following construction:—In the middle of the length of a piece of wood, or other material, a slot is formed, about an inch in length, in which is fitted a sliding hook, the lower end of which protrudes through the said slot, and is fitted with a thumb screw; another hook is screwed into the solid part of the wood, near to one end of the aforesaid slot, the bows of said hooks being placed in opposite directions, thus,)(; on one and the same side of the piece of wood a hole is formed crosswise through each end of the aforesaid piece of wood, in which a ring is placed, each ring having a long cord fastened thereto. To use this improved safety fastening the moveable hook is slackened, and the points of the two hooks passed through the bow of the key in the lock of the door, the key being inserted in that side of the lock which is in the room; and, supposing it to be a bedroom, the occupant, on retiring to rest, having first locked the door, he inserts the hooks of the fastening in the bow of the key, and, pushing the sliding hook outwards to its full extent, screws it tightly in that position, and proceeds to place the strings aforesaid behind the pillow of his bed, or in any other place within his reach when in bed. By pulling one string the key will be turned partly round and the door unlocked, and by pulling the other string the door may be locked without the person having to get out of bed for that purpose. *Patent abandoned.*

1299. R. A. Brooman. *Improvements in apparatuses for superheating steam.* (A communication.) Dated May 2, 1862.

This invention consists in the use of cast iron hollow rings, by preference three, each divided into four equal segments; the rings are of different diameters, and are arranged stepwise one above the other, and at such distances apart as will allow the products of combustion free circulation. Connection is maintained between the rings by bent tubes. The first of these hollow rings is of the same internal diameter as the flue in which the superheater is placed. When the superheater is fitted to a marine engine, steam enters directly from the boilers, and passes to the cylinders. Valves for cutting off, and admitting the steam, are fitted so as to enable the steam to pass directly from the boilers to the cylinders in the ordinary manner, without passing through the superheator, and also to enable part of the steam only to pass through the superheater and be afterwards mixed as before. Each tube is free to expand and contract independently of the others, and has only to bear its own pressure and that on the ring. This result is obtained by the tubes being bent, which renders them slightly elastic, and allows them to play without injuriously affecting their joints *Patent completed.*

1300. C. F. Whitworth. *Improvements in apparatus for signalling upon railways,* Dated May 2, 1862.

The objects of this invention are to provide against any liability to collisions, especially where there are steep gradients, curved cuttings or tunnels, and other obscure places. To provide a warning of the approach of trains to stations, crossings, opening bridges, and other places. To afford means of ascertaining at any time whether a distant signal is on or off, although from some local obstruction, fog, storm, or other casualty, the signal itself may be invisible. The peculiar merits of this invention are, that all that the proposed advantages are obtained by combined means, so arranged, that very little power and momentum are required to ensure efficient action, and the concussion of impact, even at the highest velocity of trains, is so slight as to preclude all liability to fracture or derangement in action. The invention consists in certain arrangements of apparatuses (which cannot be described without reference to the drawings) which, by the aid of electro-magnetism, work signals upon railways. *Patent completed.*

1301. M. Paul. *Improvements in windlasses and capstans or ships rounding apparatus.* Dated May 2, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1302. J. W. Gill. *Improved apparatus for turning up and pulverizing the soil of land for cultivation.* Dated May 2, 1862.

This invention consists, principally, of a cylinder with plates, lines, or other suitable implements projecting therefrom, which cylinder is connected to a traction engine, and is thereby drawn slowly over the land, at the same time that it is caused to revolve rapidly on a horizontal axis, by means of hands or suitable gearing driven by the engine, and thus to turn up and pulverize the soil. *Patent abandoned.*

1303. H. Welch. *Improvements in securing or attaching armour plates on or to ships or vessels.* Dated May 2, 1862.

In carrying out this invention, the hull or shell of the ship or vessel is constructed of iron, and the side plates or skin of the vessel at that part which is intended to be protected by armour, is constructed in such a manner that spaces are left between the plates which form the shell. The edges of these plates are bevelled inwards, so as to form a kind of dovetail joint. A dovetail groove, corresponding to that in the shell of the vessel, is planed out of the back of the armour plate, so that when the latter is bent to the proper curve, and is brought to its place on the ship's side, the two dovetails will be coincident. An alloy of copper in a molten state, and somewhat resembling gun metal, is then poured into the double dovetail groove, and will firmly hold the armour plate on the ship's side. In order to secure two contiguous plates together by their edges, dovetail grooves are planed out of the edges of the contiguous plates, and when the two plates are brought together, the double groove is filled up with the molten copper alloy, and thus a secure joint is produced. *Patent abandoned.*

1304. A. V. Newton. *Improved electrical apparatus applicable to the lighting of gas.* (A communication.) Dated May 2, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1305. W. Mossman. *Improvements in the manufacture of bonnets, hats, or coverings for the head.* Dated May 2, 1862.

This invention consists in the application of enamel cloth to the manufacture of bonnets, hats, or coverings; such cloth may be of any woven fabric, spread over with any pigment such as is used in the manufacture of enamelled or satin surfaced cloths, paper, cardboard, or pasteboard, and of any colour. The application of this enamelled cloth, or satin surfaced cloths, to the manufacture of bonnets may be either in pieces, shapes, or lengths to imitate straw, chip, crinoline, leghorn, willow, and the like. *Patent abandoned.*

1306. J. Brierley. *Improvements in the construction of fire-plugs, or valves, to be used in extinguishing fires, or other purposes where water is required to be drawn from mains under pressure.* Dated May 3, 1862.

The object of this invention is to construct fire-plugs, or valves, in such a manner that the flow of water from the main is unimpeded by any of the working parts of the valve, and, by thus reducing the friction, to secure the greatest amount of effective force. *Patent abandoned.*

1307. H. Juhel. *Improvements in wheels.* (A communication.) Dated May 3, 1862.

This invention consists in substituting for the ordinary flat band an elbowed-concave band of iron, steel, or any other metal, for wheels of every description of carriages. To this effect, the patentee makes the felly so shaped that it may receive the elbowed-concave metallic band, which clamps to the upper part of the said felly, to which it adheres, without having recourse to the heating of the said metallic band, thus avoiding the cineration or carbonization of the wood, and the subsequent inconvenience that arise from the said cineration or carbonization. This cold process, besides, allows the use of steel for bands, which has been hitherto rejected for this manufacture, as it loses, by the heating process, its primitive and peculiar properties. *Patent completed.*

1308. J. Tyler. *Improvements in the manufacture of clarionets.* Dated May 3, 1862.

Hitherto in clarionets the C sharp in the third space, and the F sharp on the third ledger line below, have been produced by a closed key on the left side of the instrument when held to the mouth. According to these improvements, the patentee changes the key which produces these notes from the left side to the right side, and makes it an open key, which is closed by the fourth finger of the right hand. In the ordinary clarionet, on the right side there is an open key, from which the notes D natural, on the fourth line, and G natural, under the second ledger line below, issue. The head, or finger end, of the lever of the latter key he places under the head or finger end of the new C sharp key. He presses down both by the fourth finger of the right hand when required. A projection or lever from the long lever B natural key acts upon the D key. On the long lever B natural key being pressed down by the fourth finger of the left hand, the D key is closed, the new key stands open, and produces the notes C sharp in the third space, and F sharp in the third ledger line below. *Patent completed.*

1309. E. Omerod and C. Schiele. *Improvements in machinery or apparatus for cutting or dressing stones, which are also applicable for hammering, crushing, or otherwise reducing metals and other materials.* Dated May 3, 1862.

This invention relates, principally, to improvements on a patent granted to Christian Schiele, dated the 22nd day of February, 1860 (No. 475), and it consists in causing the swinging tools to strike at an angle before arriving at the lowest point of motion, and in guiding them past or over the block of stone to be cut or dressed, preventing any subsequent contact. The patentees also guide them in their course during the swinging out, by centrifugal force, and control their position when striking the material, as well as regulating the depth of the cut or other action, and the subsequent rebound, without interferring with any earlier accidental strokes. *Patent completed.*

1310. H. G. Moffatt. *An improved advertising medium.* Dated May 3, 1862.

This invention consists in the employment of the wrappers of note paper for advertising purposes. Instead of merely ornamenting them and designating their contents, as at present adopted, the inventor prints or ornaments them with any desired number of designs, and of various colours, arranged so as to include a number of advertisements in suitable positions, or a separate advertisement in each design or compartment. The object is to have as many advertisements on one wrapper as may be required for utility and ornament. *Patent abandoned.*

1311. J. M. Herdevin and J. A. Julliens. *Improvements in sluice cocks.* Dated May 3, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1312. T. Snowdon. *Improvements in the manufacture of steel tyres, hoops, and cylinders, and in furnaces employed therein, and applicable to the melting of steel generally.* (A communication). Dated May 3, 1862.

This invention consists in manufacturing steel tyres, hoops, and cylinders, in angular crucibles or melting pots, and in constructing the furnaces with two or more fireplaces or gas generators, the flames or heated gases from which are caused to impinge and circulate both round the exterior and through the hollow space or interior of the crucible or melting pot, When employing the furnace for

other than angular melting pots, several separate pots or crucibles, of any ordinary form, may be arranged in one, two, or more tiers round a common centre, so as to leave a central hollow space for the reception and passage of the flame or gases. *Patent completed.*

1313. J. H. HEPPEL. *Improvements in the construction of permanent way of railways.* Dated May 3, 1862.

One part of these improvements relates to that description of permanent way where double-headed rails and the ordinary chair are employed. The inventor constructs longitudinal sleepers, either of wrought iron or puddled steel, the transverse section of which is formed of a trough shape, with a flange on either side of the trough. These longitudinal sleepers are placed opposite each other on the road, each opposite pair being connected together and kept to gauge by means of wrought iron tie bars or rods. Upon the before-mentioned longitudinal sleepers he fixes the ordinary cast iron chairs carrying the rails. These chairs are placed transversely across the sleeper, so as to rest upon each flange of the same, to which they are attached by means of pins or bolts passing through, and secured either by others, or by screwed nuts, or by riveting at the underside of the flanges. *Patent abandoned.*

1314. J. HERDMAN. *Improvements in the manufacture of wrought iron, steel, or combined wrought iron and steel plates, adapted for ship building and other purposes for which strength and lightness are required.* Dated May 3, 1862.

These improvements have reference more particularly to an invention for "Improvements in the manufacture of wrought iron plates adapted for ship building and other purposes for which strength and lightness are required," for which letters patent were granted to John Herdman, bearing date the 12th of May, 1855 (No. 1,071). In the specification of the aforesaid invention were described various arrangements for forming cellular or hollow plates of wrought iron, by welding together two or more plates having ribs or bosses upon their inner surfaces. Now, one part of the present improvements consists in forming such plates of wrought or cast steel, instead of wrought iron, or partially of wrought or cast steel and partially of wrought iron. Another part of the present improvement consists in forming one wrought iron or steel plate with ribs, bosses, or projections, and the other with grooves or recesses of a slight depth, so that when the two plates are being welded together, the ribs, or projections on the one plate enter into the grooves or recesses on the other plate, by which a more perfect union of the two plates will be effected; or, in some cases, such cellular plates may be formed by welding together a corrugated plate of iron or steel, and a flat plate placed on either side of the same, the inner surfaces of such flat plates being, by preference, somewhat grooved for those portions of the corrugated plate that come in contact with them to fit into, so as to insure a more perfect weld. Another part of this invention consists in forming such cellular plates by placing two or more flat iron or steel plates, having small projections or ribs on their faces, opposite each other, a certain distance apart, so that a space is formed between each two plates, into which space are placed suitably-formed cores, and cast-steel, in a molten state, is then poured into the remaining interstices, which, when solidified, will be firmly attached to the plates by the before-mentioned projections upon the latter being fixed in the cast-steel. The cellular plates thus formed may then be heated to a welding heat, and the parts of the same be welded together more firmly, either by hammering or by rolling. *Patent completed.*

1315. W. BLACK. *Improvements in lottery and ballot-boxes.* Dated May 3, 1862.

We cannot here give space to the details of this invention. *Patent abandoned.*

1316. G. VEAL. *Improved apparatus for obtaining and applying motive power.* Dated May 3, 1862.

Here the inventor proposes to use a very long and powerful helical steel spring wound up in a barrel, and attached by suitable gearing, to a driving wheel, either for the purpose of working machinery, or more especially for propelling carriages on common roads. The spring will, by its length and power, exercise its influence for a lengthened period, and when exhausted, or nearly so, it may be removed, whereby in a small compass a motive power may be obtained and applied to various useful purposes. *Patent abandoned.*

1317. M. HENRY. *Improvements in the process of and apparatus for preparing materials for the manufacture of paper, and in obtaining products from agents used in the same process, part of the invention being also applicable to apparatus for washing.* (A communication.) Dated May 3, 1862.

According to these improvements the materials are disposed in or separated into thin layers, or strata, which are divided or separated from each other, and in that divided or separated condition undergo the boiling, heating, steaming, alkaline treatment, washing, or other disintegrating or preparing process or processes. Moreover, while the process is being carried on, the materials should be kept from contact with the sides of the boiler, receiver, or holder containing them. They may also be separated, stirred, or moved about during the treatment. *Patent abandoned.*

1318. J. FOWLER. *Improvements in engines for hauling agricultural implements.* Dated May 3, 1862.

According to this invention, the patentee so constructs the engine that it may be used either for ordinary tilling or for drain ploughing. This he does by mounting underneath the boiler of the engine, and between the fore and hind wheels, two drums mounted on vertical axes, and so drawn that one makes several revolution for each revolution of the other, the two axes being geared the one to the other by spur wheels properly proportioned. The fast running drum he prefers to have nipping instruments upon it, so that it may hold a hauling rope which passes only half round it. The slow running drum he prefers to be a winding drum to wind or coil up the rope upon itself, but it may be a nipping drum very strongly made. In place of mounting both the fast and the slow drums, so that they both remain permanently on the engine, he sometimes so arranges the apparatus that the fast running drum may be removed, and a slow running drum, with its intermediate gear, substituted therefor, the frame of the engine being accurately fitted and prepared to receive such parts. *Patent completed.*

1319. E. MEROLLA. *Improvements in firearms.* Dated May 3, 1862.

This invention consists in the employment of a cover to the nipple, which, when the piece is put at half-cock, can be brought over the nipple and cap thereon, so as to protect the cap from blows arising from the accidental descent of the hammer or otherwise, and likewise to protect it from rain and moisture. *Patent completed.*

1320. W. E. NEWTON. *An improved method of joining boxes.* (A communication.) Dated May 3, 1862.

This invention has for its object to join the ends of boxes in a more perfect, neat, and efficient manner than can be done with nails or glue, or by dovetailing the ends. The invention consists in the employment of strips of metal bent into an angular form, and inserted endwise into the slots cut in the bevelled ends of the box stuff, by sawing or otherwise, so that these strips, when inserted, will bind and secure the corners tightly together. *Patent completed.*

1321. J. MELLODEW and T. MELLODEW and C. W. KESSELMEYER. *Improvements in looms for weaving.* Dated May 3, 1862.

This invention refers to a method of making the shed in looms, and consists in interrupting the motion communicated by the motive power to a roller or other apparatus, so that it may be caused to deviate from its course in the one direction or the other, and so impart an upward or downward motion to the picks or heddles. *Patent completed.*

1322. C. SCHLICKEYSEN. *Improvements in machinery for moulding bricks, tiles, pipes, and turf.* Dated May 3, 1862.

This invention is not described apart from the drawings *Patent completed.*

1323. J. HEYWORTH. *Improvements in looms for weaving.* Dated May 3, 1862.

This invention consists in causing the continued motion of the loom to be dependent upon the shuttle having struck the check "strap" or straps. For this purpose, the patentee connects the check strap to an arm capable of being moved out of the way of the "frog" when the said strap is struck by the shuttle, but should the shuttle become "trapped," then the check strap, not being acted upon, allows the said arm to remain in a line with the "frog," so that the motion of the loom is arrested. *Patent completed.*

1324. P. V. LEFEBVRE. *A self-feeding pen-inkstand.* Dated May 3, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1325. A. WILLIAMS. *The construction of a backed form or seat capable of being converted into a level table with seat, or a desk, either level or sloping, or at any angle.* Dated May 5, 1862.

This invention consists of an iron standard consisting of two uprights, connected at the top and bottom by horizontal iron plates, at the upper front corner of which a tenon is inserted and secured by a pivot in the mortice of the other portion of the standard, to which is attached the board to form the back of the seat. Down upon the horizontal plates before mentioned, another board is secured, and forms the seat itself. By raising the back board before mentioned, and turning it forward upon the joint formed by the mortice and tenon before referred to, the back board of the seat forms a level table; or, by being secured by a screw through the cheek of the mortice to be turned forward against the tenon, the back board will be held in any sloping position required, and will form a writing desk. *Patent completed.*

PROVISIONAL PROTECTIONS.

Dated July 14, 1862.

2026. O. P. Drake, Massachusetts, America. A new and useful or improved apparatus for vapourizing and aërating a liquid hydro-carbon to be burned for illumination, or for other purposes.

Dated September 22, 1862.

2588. J. Long, Gorleston, Great Yarmouth. An improved machine for cleansing and scraping streets, roads, or ways.

Dated October 21, 1862.

2840. C. Trees, Blackfriars-road, and F. C. Belhomme, New-street, Covent-garden. Improvements in hats, caps, bonnets, and other coverings for the head.

Dated October 23, 1862.

2853. A. Chaplin and G. Russell, Glasgow, engineers. Improvements in obtaining fresh water by evaporation, and in apparatus therefor.

2857. M. C. A. Perkes, Belvedere-house, Rosendale, Dulwich, spinster. An equilibrium double-action revolving rudder, self-balancing drag, and improved steering gear. (A communication.)

2859. H. Donald, Johnstone, Renfrew, engineer. Improvements in machinery or apparatus for bending or straightening metal plates.

2861. J. Field, Lambeth, engineer. Improvements in steam engines, condensers, and boilers.

Dated October 24, 1862.

2863. A. J. F. V. Brepson, 30, Boulevard de Beaumarchais, Paris, architect. A siphoidal cistern, with water reservoir, for kitchen or other drains in communication with infected sewers.

2865. L. Groux, Victoria Soap Works, Woodhouse Junction, near Sheffield. Improvements in the manufacture of soap, and in machinery for that purpose.

2867. J. R. Nicholl, Streatham, Surrey, clerk. An improved construction of fireplace or stove grate.

2870. P. S. Devlan, Buckingham-street, Strand, engineer. Improvements in the manufacture of bearings, steps, axle-boxes, and other surfaces and appliances or articles subjected to friction.

Dated October 25, 1862.

2873. W. Owen, Rotherham, engineer. Improvements in stoves.

2875. D. Brown, Smethwick, and W. Brown, Smethwick, gun barrel manufacturers and iron masters. Improvements in rolling machinery for rolling gun barrels, cannons, and other articles.

2877. W. Clark, 53, Chancery-lane. An improvement in the construction of the joints of cast iron gas and water mains and other pipes. (A communication.)

2879. P. Alfraise, 51, Rue de Malte, Paris. Improvements in sewing machines.

2880. T. G. Ghislin, Hatton-garden, importer. Improvements in the treatment and utilization of certain foreign plants for the obtaining of useful fibres therefrom.

2881. E. A. L. Negretti and J. W. Zambra, Hatton-garden, meteorological instrument makers. Improved apparatus for ascertaining or testing the explosibility of liquid hydro-carbons. (A communication.)

Dated October 27, 1862.

2883. J. Chattwood, Bury, architect. Improvements in ventilating rooms and cellars.

2885. J. H. Johnson, 47, Lincoln's-inn-fields, gentleman. Improvements in heating glass furnaces. (A communication.)

2887. F. Lipscombe, 233, Strand, water filter manufacturer. Improvements in purifying water.

2891. J. J. Ridge, Thomas-street, St. John's, Southwark. Improvements in treating certain farinaceous substances applicable to infants' or invalids' food, and in apparatus to be employed therein.

2895. T. Richardson, Newcastle-upon-Tyne, chemist. Improvements in the manufacture of sulphate of soda.

Dated October 28, 1862.

2897. J. Chalmers, 8, Knight's-place, Wandsworth-road. Improvements in armour plating ships of war and fortifications.

2901. H. Allen, St. James-place, St. James-street, engineer. Improved apparatus for preparing leaves and stalks of plants for being cleaned or dressed for the purpose of obtaining the useful fibres they contain.

2903. E. S. Tudor, Upper Thames-street, white lead manufacturer. Improvements in the purification of lead.

2905. J. Jeffreys, The Rise, Hoddesdon, Herts. Improvements in constructing surface condensers and apparatus for heating and cooling fluids.

Dated October 29, 1862.

2907. A. Ripley, Brook-street, West-square, engineer. Improvements in the construction of pistons for steam engines, which improvements are also applicable to air and liquid pumps.

2903. A. Shanks and F. Kohn, engineers, 6, Robert-street, Adelphi. Improvements in hydrostatic presses.

2909. G. Darlington, Minera, Denbigh, zinc smelter. Improvements in the manufacture of zinc oxide.

2911. A. Hogg, Londonderry, shirt manufacturer. Improvements in smoothing irons.

2913. W. Clark, 53, Chancery-lane, engineer. Improvements in the treatment of copper ores, and in apparatus for the same. (A communication.)

2914. I. W. Lister, J. Bottomley, and W. Bottomley, Well-oth-lane, Rochdale, tool makers. Improvements in looms for weaving.

2915. W. Cook, 26, Spring-gardens, civil engineer. Improvements in apparatus for ventilating.

2917. W. E. Gedge, 11, Wellington-street, Strand. Improved apparatus in connection with the pans of water-closets. (A communication.)

2919. D. Fryer, Carlton-square, Old Kent-road, and J. W. Meears, Annett's-crescent, Islington. Improvements in casks, tanks, or other receptacles for containing petroleum and other oils or spirits.

2921. J. Unsworth, Rochdale-road, Manchester, engineer. Improvements in steam engines.

2923. H. P. F. Newham, St. Mary's-gate, Nottingham, lace manufacturer. Improvements in the manufacture or production of reversible shawls.

2924. J. Fletcher, sen., Leeds, and J. Fletcher, jun., Newcastle-on-Tyne. Improvements in forming wrought iron wheels, and in the tools and apparatus for making the same.

Dated October 30, 1862.

2925. J. Lockwood, Batley, York, rag merchant. Improvements in boilers.

2927. F. Gregory, Manchester, Lancaster, agricultural machinist. Improvements in presses for pressing seeds, fruits, hops, and other substances.

2929. J. Eaton, King's Norton, Worcester, chandelier maker. An improvement or improvements in the manufacture of certain kinds of gas burners for illuminating purposes.

2931. P. Giffard, 66, Boulevard des Batignoles, Paris, civil engineer. Improvements in air guns and other arms.

2933. J. Birch, New Norfolk-street, bricklayer. Improved apparatus for unstopping or clearing from obstructions drains, water closets, stack, water, and other pipes.

Dated October 31, 1862.

2937. W. R. Bowditch, clerk of St. Andrews, Wakefield. Improvements in carburetting or napthalizing gas, and in the apparatus employed therein.

2938. H. L. Corlett, Inchicore, Associate of the Institution of Civil Engineers. Improvements in the construction of tuyeres.

2939. G. Dickinson, Smethwick, manufacturer, and E. Cook, Smethwick, manager of works. Improvements in the construction and ornamentation of metallic bedsteads, couches, and children's cots.

2941. A. Andrews, Birmingham, mechanic. An improved tool for cutting and rasping pegs in boots and shoes.

2943. G. H. Morgan, Hereford. Improved mechanical arrangements for raising and lowering bodies.

2945. M. C. de C. Sinibaldi, 1, South-villas, South-street, Greenwich. Improvements in the manufacture of armour plates for ships, fortifications, and forts, and in the manufacture of plates to be used in the construction and building of ships, and for attaching copper, or other like protective metal to the outside of metal plates, for making copper bottoms, or bottoms with a similar protection, to iron ships, and for other purposes.

2949. W. E. Newton, 66, Chancery-lane, civil engineer. Improvements applicable to the carriages and beds of guns, mortars, and other ordnance. (A communication.)

2951. J. G. Marshall, Leeds, flax spinner. Improvements in the treatment of the straw of flax, hemp, and other similar vegetable substances preparatory to spinning the fibre thereof.

2953. J. J. Anderson, St. James-street, Northampton, currier. A new or improved mode and means for the production of leather from waste leather scraps, and also for producing from such waste leather scraps, in combination with india rubber, gutta percha, or other like substance, a new material to be used as leather, and for other purposes.

Dated November 1, 1862.

2955. J. W. Taylor, Newsome, near Huddersfield, manufacturer. Improvements in scouring or cleansing woollen, worstead and cotton fabrics, and other fibrous materials, and in the means or apparatus employed therein.

2961. J. Winter, Wardour-street, Soho. An improved safety tap or cock, applicable to gas burners, gas pipes, and vessels containing gas; also water pipes, steam pipes, and vessels containing inflammable and other liquids, compressed air, and spirituous liquors.

Dated November 3, 1862.

2963. J. Musgrave, Globe Iron Works, Bolton-le-Moors. Improvements in the valves of steam hammers, and steam, hydraulic and gas engines.

2965. L. Gonez, 15, Passage des Petites Ecuries, Paris, merchant tailor. A seat or chair forming also a travelling bag, for the use of travellers by rail or other way.

2966. F. Trachsel, chemical engineer, and T. Clayton, machinist, Manchester. Improvements in machinery or apparatus for obtaining light, heat, and ventilation, parts of which improvements are also applicable to other purposes.

2967. G. Hollins, Manchester, currier and strap manufacturer. Improvements in the manufacture of straps or belts for machinery.

2971. D. Scattergood, Nottingham, machinist. Improvements in circular frames for the manufacture of looped fabrics.

2972. P. F. C. Cheveron, and E. C. Eichenberg, Paris, Boulevard Rochechouart, 30bis, engineers. A new method of, and apparatus for, weaving Indian shawls and other figured tissues.

2973. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in machinery for moulding and compressing artificial fuel, peat, bricks, tiles, and other substances. (A communication.)

Dated November 4, 1862.

2975. J. B. Francis, Hullard Hall-lane, Stretford, near Manchester, cabinet maker. Improvements in apparatus for raising and lowering window blinds, maps, and other articles, and for retaining them in position.

2976. J. Lefebvre, 54, Rue des Tournelles, Paris, architect. A new improved instrument for indicating angles or variations of level, and for measuring horizontal and vertical distances.

2977. F. Durand, Paris, mechanical engineer. An improved cotton gin.

2979. J. H. Johnson, 47, Lincoln's-inn-fields, gentleman. Improvements in hanging, arranging, and operating ordnance. (A communication.)

2981. J. Place, Over Darwen, Lancaster, spinner and manufacturer. Certain improvements in looms for weaving.

2983. T. Huntley, Manchester. Improvements in kitcheners and kitchen ranges, and in cooking and bath heating apparatuses.

2985. J. Shirt, Tamworth, Stafford, paper maker, and C. Briggs, Alders Mill, Tamworth, paper manufacturer. Improvements in apparatus for condensing the steam of high pressure steam engines.

2987. A. C. Dewies, Nicholl-square, Aldersgate-street. An improved lubricator.

Dated November 5, 1862.

2989. J. B. Thomas, Paris. Improvements in apparatus for working and controlling railway signal discs.

2991. J. Banwell, Watlington, Oxford. Improvements in apparatus for punching by means of hydraulic pressure.

2995. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in spinning frames. (A communication.)

2997. A. V. Newton, 66, Chancery-lane, mechanical draughtsman. A new process of obtaining printing surfaces, dies, and substitutes for photographic negatives. (A communication.)

3001. J. J. Laveissière, 58, Rue de la Verrerie, Paris, merchant. Improvements in the manufacture of tubes of copper or other metals and alloys.

Dated November 7, 1862.

3010. C. O. Heyl, Berlin, manufacturer. Improved means and machinery to be used for the purpose of extracting fatty oils from oleaginous seeds, and for purifying the said oils, and for extracting the agents employed from the exhausted residue.

3012. A. V. Newton, 66, Chancery-lane, mechanical draughtsman. Improvements in repeating fire-arms. (A communication.)

Dated November 8, 1862.

3016. H. Kilshaw, Haslingden, Lancaster, spinner, and E. Lord, Rawtenstall, mechanic. Certain improvements in power looms for weaving.

3018. C. W. Spruyt, New Broad-street, City, civil engineer. Improvements in rails for railways.

3022. G. Kent, High Holborn, and E. P. Griffiths, High-street, Camberwell. Improvements in apparatus for reducing cocoa berries and other vegetable and animal substances to powder or pulp, and fof mashing potatoes.

Dated November 10, 1862.

3026. J. Whitaker, Leigh, Lancaster, agricultural implement maker. Improvements in machinery or apparatus for pulping, stripping, and slicing edible roots for cattle.

3028. S. Berrisford, Stockport, Chester, machinist, and W. Ainsworth, Stockport, Chester, overlooker. Certain improvements in looms for weaving.

3030. R. J. Chapman, South-street, Camberwell. Improvements in the manufacture of glass and emery paper or cloth.

3032. W. E. Newton, 66, Chancery-lane, civil engineer. Improvements in the treatment of maize or Indian corn preparatory to grinding the same into flour. (A communication.)

3034. T. G. Ghislin, Hatton-garden, importer. Improvements in the treatment of certain foreign plants, and in the application of the fibres derived therefrom.

Dated November 11, 1862.

3036. G. Davies, 1, Searle-street, Lincoln's-inn. Improvements in the construction of crinoline skirts. (A communication.)

3038. W. Palliser, Dublin, Captain of Her Majesty's 18th Hussars and Brigade-Major of Cavalry. Improvements in the construction of ordnance, and in the projectiles to be used therewith.

3040. J. J. Parkes, London-street, Paddington, bell-hanger and gas engineer. Improvements in lever bell pulls.

Dated November 12, 1862.

3042. W. Harper, Sharples, near Bolton-le-Moors, bleacher. Improvements in the construction of steam boiler and other furnaces.

3048. F. J. Clowes, 92, Southwark-bridge-road, engineer. An improvement in obtaining rotary motion.

3050. J. H. Thomson, Glenboig, Lanark, brick maker. Improvements in machinery or apparatus for finishing and dressing tiles and similar articles of clay.

3052. A. Graemiger, Wallenstadt, canton of St. Gall, Switzerland, manufacturer. Improvements in looms.

Dated November 13, 1862.

3058. M. Defries, Houndsditch, manufacturer. Improvements in the manufacture or construction of lamps.

3060. R. and P. Sykes, Huddersfield, machine makers. Improvements in rings used in machines for the continuous spinning, doubling, and twisting of wool and other fibrous materials.

3062. G. Davies, 1, Searle-street, Lincoln's-inn, civil engineer. Improvements in preserving provisions. (A communication.)

3064. E. Joseph, 134, Blackfriars-road, and J. Danks, 56, Webber-row, Waterloo-road. Improvements in the manufacture of brushes, brooms, and mats.

INVENTION PROTECTED FOR SIX MONTHS BY A COMPLETE SPECIFICATION.

Dated November 13, 1862.

3061. E. S. Ritchie, Brookline, Massachusetts, America. Mariner's compass.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

2012. D. Bateman. Carding wool and other fibrous substances.

2019. C. and J. W. Crossley. Washing and finishing textile fabrics.

2026. O. P. Drake. Vaporizing and aerating a liquid hydro-carbon to be burned for illumination or for other purposes.

2029. A. Couvreux. Centrifugal apparatus for breaking stones.

2030. J. Green. Producing signals.

2031. A. Couvreux. Casting stones.

2033. W. Dickens and J. Hewitt. Self-acting and hand mules.

2037. G. T. Selby. Superheating in tubes and tubular articles.

2045. H. Appleby. Armour plates for ships.

2060. R. Barrett. Working the damper of steam-engine furnaces.

2065. W. E. Newton. Preparing fibrous substances for combing. (A communication.)

2066. T. H. Saunders and J. Millbourn. Manufacture of paper.

2070. E. Bazin. Electric railway carriage signal.

2071. W. E. Gedge. Excavating or boring apparatus. (A communication.)

2072. T. Davey. Manufacture of gunpowder and explosive compounds.

2074. A. Naudain, J. Peacock, and W. H. Walton. Looms for weaving.

2082. J. Daniels. Artificial manure.

2088. T. King. Measuring malt, grain, and other granular substances.

2091. A. C. Vautier. Obtaining fibrous materials.

2099. R. Bell. Manufacture of bricks. (A communication.)

2107. W. H. Perkin. Printing and dyeing. (A communication.)

2109. M. Henry. Retarding and stopping carriages. (A communication.)

2112. J. Anderson. Separating gluten from starch.

2119. A. Lahousse. Construction of railway wheels.

2127. J. Walton and J. Moore. Ventilating and heating.

2136. A. Noble. Obtaining and treating compounds of alumina.

2139. F. Selby. Surface condensers.

2156. G. Nock. Self-acting crossing for railways. (A communication.)

2163. J. Benyon. Looms.

2171. W. Weild. Cutting, shaping, rolling, drilling, screwing, milling, and fluting metals.

2175. A. V. Newton. Machinery for planing metal. (A communication.)

2198. J. Townsend. Damping cotton and other fibrous materials and fabrics.

2206. W. G. Valentine and F. Levick. Generation of combustible gases for lighting and heating purposes.

2216. W. Clark. Rig, spars, and sails of ships and other vessels. (A communication.)

2316. W. E. Newton. Connecting plates, sheets, or slabs of metal, or other materials, and fastening the same on to framing applicable to armour plating for ships, vessels, or batteries, and to roofing and other similar purposes. (A communication.)

2404. W. Upfill, W. Morton, and W. Asbury. Construction of wheels and axletrees for carriages.

2458. S. H. Hadley. Manufacturing gas for illumination.

2832. C. G. Clarke. Garden shears.

2837. J. Duke, and J. Cleaver. Manufacture of cement.

2872. J. Carpendale. Producing chasing on metals.

2949. W. E. Newton. Carriages and beds of guns, mortars, and other ordnance. (A communication.)

2951. J. G. Marshall. Treatment of the straw of flax, hemp, and other similar vegetable substances.

3061. E. S. Ritchie. Mariner's compass.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'

LIST OF SEALED PATENTS.

Sealed November 21, 1862.

1509. J. Eastwood.
1541. J. H. Perry.
1543. G. Crawford.
1559. J. Ward, and J. Dewick.
1569. M. Walls, and J. Crompton.
1570. J. Taylor.
1585. J. Ireland.
1591. J. Duffus.
1614. G. Ashton.
1620. W. Clark.
1643. R. Shortrede.
1665. E. Lloyd.
1678. G. Peel, jun., and J. Simpson.
1760. C. A. Tyler.

Sealed November 25, 1862.

1596. H. Eaton.
1597. J. H. Kidd.
1600. C. Cohen.
1602. R. Martindale.
1603. T. Turner.
1605. J. Hirst, jun., and E. O. Taylor.
1606. R. A. Brooman.
1611. J. Hirst, jun., and J. Wood.
1617. C. D. Abel.
1619. J. Paterson.
1621. N. Lawton and R. P. Whitworth.
1634. W. Eddington, jun.
1637. A. Gilbey.
1639. G. Ermen and R. Smith.
1640. W. T. Smallwood and W. Wright.
1641. A. Moreau and A. E. Ragon.
1654. B. Templar.
1662. C. E. Gray.
1722. A. J. Joyce.
1754. M. Jackson.
1787. J. Hunt.
1820. D. Adamson and L. Leigh.
2062. A. Cotelle.
2431. J. B. Thompson.
2432. Sir W. O'S. Brooke.
2506. W. Richards.
2565. W. Glass.
2582. L. Dixey and G. Smith.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2624. J. Petrie, jun., and J. Lord.
2646. R. Mushet.
2680. T. Watson and G. Healey.
2757. F. Coignet.
2645. C. G. Hill.
2666. W. Smith.
2668. T. Carr.
2663. A. Hubart and V. Cantillon.

PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2618. D. S. Price and E. C. Nicholson.
2619. D. S. Price and E. C. Nicholson.
2645. J. Jobson.
2659. F. Coignet.
2631. J. Roberts, jun.
2637. C. T. Dunlop.
2653. C. Sanderson.
2664. J. Clark.
2687. R. A. Brooman.

LIST OF SPECIFICATIONS PUBLISHED

For the Week ending November 22, 1862.

No.	Pr. s.	d.	No.	Pr. s.	d.	No.	Pr. s.	d.	No.	Pr. s.	d.	No.	Pr. s.	d.	No.	Pr. s.	d.
1026	0	4	1045	0	10	1063	0	10	1081	0	10	1099	0	4	1117	0	4
1027	0	10	1046	0	4	1064	0	4	1082	0	4	1100	0	10	1118	0	4
1028	0	8	1047	0	4	1065	0	8	1083	0	4	1101	0	8	1119	0	4
1029	0	8	1048	0	8	1066	0	4	1084	0	4	1102	0	4	1120	0	8
1030	0	4	1049	0	8	1067	0	4	1085	0	8	1103	0	4	1121	0	4
1031	0	10	1050	0	4	1068	0	4	1086	0	8	1104	0	10	1122	0	10
1032	0	10	1051	0	8	1069	1	0	1087	1	10	1105	0	4	1123	0	4
1033	0	4	1052	1	8	1070	0	10	1088	1	2	1106	0	4	1124	1	6
1034	0	10	1053	1	6	1071	0	4	1089	0	4	1107	0	6	1125	0	10
1035	0	4	1054	1	0	1072	0	4	1090	0	4	1108	0	6	1126	0	4
1036	0	4	1055	2	6	1073	0	4	1091	1	0	1109	0	10	1127	0	4
1037	0	8	1056	0	4	1074	1	8	1092	0	4	1110	0	10	1128	0	8
1038	0	4	1057	0	4	1075	0	8	1093	0	4	1111	0	8	1129	0	10
1039	0	8	1058	0	8	1076	0	8	1094	0	6	1112	0	4	1130	0	4
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1041	0	4	1060	0	4	1078	0	10	1096	0	8	1114	0	4	1132	1	2
1042	0	4	1061	0	8	1079	0	4	1097	0	8	1115	0	4	1133	0	6
1043	0	6	1062	0	6	1080	0	4	1098	0	4	1116	0	4	1134	1	4
1044	0	10															

Note.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, DECEMBER 5, 1862.

AGRICULTURAL STEAM ENGINES.

We look forward to next week's Smithfield Club Show at Islington with some degree of hopefulness. For the last seven months the products of the leading agricultural engineers of the kingdom have been open to our inspection at Kensington. In doing our duty as recorders of progress in the mechanical manufactures, we have taken advantage of the long sojourn of the agricultural exhibits in the Eastern annex to examine and contrast their different designs, as far as this was possible without taking them to pieces, or seeing them at their work. We wonder, therefore, whether similar comparisons have been instituted by the different Eastern annex exhibitors, and if so, with what results. That exhibition was certainly a very remarkable one. Agricultural engineers are exhibiting all the year round at some place or another, and that not merely in England, but also on the Continent. The result was that they were quite in their element at Kensington. All the "stands" were arranged to produce the best possible effect. There were attendants to each one, with polyglot qualifications, and "catalogues" in all the languages of Europe; equally well prepared to attract a purchaser, whether in the shape of an English farmer, a French "agronome," or a German "econom." Certainly "agricultural engineers" do not hide their light under a bushel; we might even venture to hint that they are more inclined to place their light in front of the "patent reflector" of puffery. The advance in late years of this branch of mechanical engineering has, no doubt, been greatly owing to the competition induced at the various agricultural shows. They have what may be termed a democratic or levelling influence; an old-established firm cannot rely for success on its pedigree alone, and, as has been well said, "little blacksmiths have become great agricultural engineers." Nevertheless, the want of scientific precision and care evinced in conducting the trials of the implements by the Royal Agricultural Society, have done much to impede sound progress. The "fire-side farming" and "carpet engineering" rules, framed by the titled cyphers and the ignorant busybodies composing the council, have allowed things to subsist and flourish, that might certainly have been long ago eliminated. We would not be understood as saying that the best conducted trials could change the current of trade, could make or unmake a firm, but we do say that they ought to be a sure guide to non-engineering purchasers. It would take us too far at present to enter into an examination of the way in which these trials have been conducted, and the plan which should be adopted for the future. We will, however, offer some remarks upon the steam-engines of the two principal makers. These are Clayton and Shuttleworth, of Lincoln, and Ransomes and Sims, of Ipswich. Messrs. Clayton and Shuttleworth are well known for the number of agricultural engines they have turned out of their shops during the last few years, and Messrs. Ransomes and Sims, for the number of years they have been manufacturers. The engines of some of the other makers, bear a suspicious family likeness to those of the first named firm.

The mechanical details and the workmanship of the engines, from the Stamp End Works, are certainly very good. We should, however, prefer seeing packing pieces placed between the joints of the eccentric straps. An indifferent engine-driver would then not be so liable to screw up the eccentric clips so tightly as to break them on starting the engine. The straps also seem to us rather slight, and they would be altogether a better job if the oil cups were cast on them. Oil cups could also be forged on to the connecting rod straps. So many engines are made at the Stamp End Works, that this could be very well afforded. We have also noticed a slovenly plan these makers have of putting packing pieces under their governor brackets &c. A reprehensible omission in the Clayton and Shuttleworth engines consists in the fact, that the reciprocating parts are not counterbalanced. Is science at such a discount at Lincoln, that the sages of the Stamp End Works do not know the virtue of counterbalancing an engine, making, perhaps, 150 revolutions per minute? In some of the portable engines too, the exhaust pipe is carried back inside the whole length of the boiler. This may be termed an ingenious plan for *superheating* the exhaust on waste steam! Any shilling book on the laws of heat would enlighten the first best hand labourer on the results of such a plan.

The engines of Ransomes and Sims are, in some respects, a direct contrast to those of Clayton and Shuttleworth. They are neatly counterbalanced by a strip of metal being cast on to the fly wheels. The exhaust pipe of their ordinary portable engine is carried back outside on the top of the boiler, at the expense, however, of an ugly unmechanical flat casting to clear the crank. The workmanship is first class. The general arrangement and the details, however, of the Ipswich engine are very much inferior to its Lincoln rival. The crank of the portable engine is actually in the exact centre between the crank shaft brackets, being thus at a considerable distance from any bearing. The two ends of the connecting rod are formed in the following way:—The caps are united to the main rod by two bolts to each. This might, perhaps, pass muster some few years ago before slot drills were invented. The nuts to these are towards the inside of the rod; there are three holes drilled through each nut, and a pin is driven right through both nuts and through the connecting rod to keep them from getting loose. An ugly set off is left on the rod to make up for the weakening caused by the hole. It will thus be evident, that when the brasses get worn the engineman is tied to an exact 1-6th of the pitch of the screws in tightening up the brasses. These brasses are, by the bye, only turned where they fit inside, the cap and rod being bored out, and they have also too much opening between them to work sweetly for a length of time. The whole construction of the rod results in getting its shorter as it wears away, and is proportionately tightened up. We suppose that this is intended to be met by the cross head being actually *screwed* on to the piston rod, and by an extra clearance being left in front of the cylinder, thus involving continual loss of steam. There is no arrangement to take up the wear of the slide blocks or the slide bars, no packing slips between the bars, &c.

The crank, also, of the 15-horse stationary engine in the eastern annex was forged on to the shaft, and being of the same breadth all through, it looked very offensive to the eye. There are several other little things in the Ipswich engine that are not of first-class design, to which we will not further allude.

How is it that the Lincoln engine is so much superior in its details to its Ipswich rival? It appears to us that the answer is to be found in the fact that the Lincoln makers have probably taken for sample some good locomotive work. Locomotives are made by engineers for the use of engineers, and are put to work where slipshod details would involve the loss of hundreds of lives and thousands of pounds sterling. We consider that agricultural engine-makers would do well to take some more hints from the locomotive builders. We will instance Mr. Aveling's traction engine, which we believe is the best we have yet seen, particularly for agricultural purposes. What locomotive builder, however, would think of using a single cylinder on such an engine, thus involving a total powerlessness at the two dead points? Or would he allow the traction link to drag on the seams of his fire-box?

The problem of consuming smoke has been rendered a very simple and cheap affair on locomotives. How is it that nothing of this kind has been attempted for portable engines, with such facilities for this purpose? Portable engine builders always say that their endeavours are much restricted by low prices, when any addition is proposed to their engines. Surely a deflecting-plate, and a few firebricks in the fire-box, with a blower pipe in the smoke-box, would not cause much additional expense. The steam could also be raised much quicker, besides the smoke being prevented, or, at any rate, much diminished. Light, cheap, steam-packed pistons, are the sole ones now used in locomotive practice. All the designs of pistons we have seen for portable engines, have been of the old-fashioned massive character. The application of that elegant feed apparatus—Giffard's injector—would also be an improvement on portable engines. As the farmers have not the science to specify such an addition, we presume that the makers generally are not inclined to be over quick in taking, say, £8 of work off their goods for the sake of an improvement.

The continental portable engines in the Exhibition, with many defects, had some good points, that might be imitated more generally. Many of them had the engine on one casting, thus avoiding any alteration of the centres through the expansion and contraction of the boiler. The continental trade, to which the agricultural engineers of England are looking forward to as an important *debouché* for their products, requires economy of fuel. Accordingly, most of these foreign engines had expansion valves, and feed-water heating apparatus. Some of the portable engines we have seen in the Eastern annex, are, undoubtedly, below criticism. Mr. Disraeli has said that Londoners would never get a good architectural building till they had hanged an architect. We wonder whether farmers will have to apply the same recipe to some "noted" implement maker, before they get a good engine, and a simple thrashing machine.

H.

THE ATLANTIC TELEGRAPH.

Periodically, and as if by necessity, the great question of uniting Europe and America by telegraph, surges up and demands a practical solution. And it is quite natural that it should do so. No scientific industry of modern times has been more economically successful than the electric telegraph. There are now at work, in the United States of America, 40,000 miles of telegraph, extending from San Francisco, on the Pacific, to Newfoundland, on the verge of the Atlantic Ocean—where it is again proposed to land a cable which shall have its other end at Valentia Bay. There are upwards of 150,000 miles of working telegraph in Europe. A telegraph spanning

the Atlantic would unite the electric wires of America with those in Europe—as those in Europe are now united with many in Asia and Africa. Establish a telegraphic link between Newfoundland and Ireland, and instantly means would be taken to connect our West Indian Colonies and those of other countries with the mainlands of North and South America—thus bringing the whole industrial system of the two Americas into connection with that of nearly all the rest of the world. This question of an Atlantic telegraph is not merely economically and morally interesting to England and the United States, but it involves world-wide results. It would not only be the greatest triumph of science, but it would be the means of bestowing a rich inheritance of blessings on mankind. It is a benefit which the statesman, the capitalist, the economical reformer, the philanthropist, and philosopher, may heartily join hand-in-hand to promote. We believe it is possible and practicable; and if the Governments of England and the United States will render legitimate assistance, the great idea may soon be made a great fact.

It may be said that an attempt was made a few years since, and the result is a useless and perishing cable at the bottom of the Atlantic. It would be folly to pass over this significant fact in silence. The failure of that cable should not, however, be a rock to discourage, but rather a beacon to guide in the pathway of future efforts. It is almost certain that the Atlantic cable failed from controllable causes. It was manufactured and laid with undue haste. Conditions, moral and scientific, which should have been complied with, were trifled with, or neglected. In a second attempt more care must and will be taken. During the last few years, most valuable experience in the manufacture and submergence of cables has been gained. Improvements have taken place in the method of constructing cables. Any one who saw some of the specimens of gutta-percha in the eastern annex of the International Exhibition must have been struck with the great improvements made in the production of that material. We remember seeing one large sheet, as thin as note paper, and almost as transparent as glass. The gutta-percha, therefore, which was used in the first Atlantic cable was much inferior to that what may be used in a second Atlantic cable. We have improved processes for testing the capacity of gutta-percha and india-rubber, and also improved instruments for measuring the integrity of insulation. But, besides those improvements in the products and processes of manufacture, we can appeal to stubborn facts. Since the failure of the Atlantic cable, some of the most important submarine cables have been laid, including those from England to Hanover, from England to Denmark, from France to Algiers, and from Malta to Alexandria. All these, and others which might be specified, are in excellent working order. Out of the total number of 51 different submarine telegraph enterprises, which are all that have been entered upon, 44—comprising 5,133 miles of cable, and 8,906 miles of conducting wire—are at the present moment in perfect working order. Thirty of these 44 successful cables were laid by Glass, Elliot, and Co. That firm, we are informed, have never lost a cable. The Gutta Percha Company made, we believe, the "cores" of all the existing submarine cables. These facts are significant and instructive, and they may assist to explode the fallacies of theoretical critics, and put to flight the fears of cautious capitalists. At all events, they are encouraging data for future efforts. Up to the present time, the telegraphic enterprise has been successful. Let any one compare the prosperity and prospects of our telegraphic companies with a similar number of companies taken promiscuously from the commercial world established since 1851, and he will find the former the most prosperous. Considered in the light of speculation, telegraphic companies may confidently challenge comparison with any other class of companies. Considering, also, the comparative infancy of the science of electricity, and the engineering and other difficulties in the way of applying that science to commercial purposes, we are surprised that more mistakes have not been made, and that greater losses have not been endured.

Let us once more appeal to the testimony of facts. The inland ærial telegraph of the British Isles, without any foreign intercourse, send upwards of one million and a half messages per annum. There are still more messages sent by the ærial system of telegraph in the United States. The Submarine Telegraph Company sent, on an average, 470 messages a day in 1860; 630 messages a day in 1861; and during the present year the same company have averaged 844 messages a day. The months of July, August, September, and October, show separately an average of nearly 1,000 messages a day. We have not the returns by us to show the progress of the International Company. But we find, from a return of that company, that during the last three months, they have sent daily 524 messages. At the present moment, the actual rate of telegraphic traffic with the Continent cannot be less than half a million messages per annum, or, for 300 working days, a traffic of 1,660 messages per day. A cable, tying together the two Continents of Europe and America, would, of course, connect the telegraphic systems of the Old and New Worlds. Such a cable, if successfully laid, could not, we think, fail to pay. It would be travelling beyond our province to enter into details about the price of messages, and the number of them likely to be sent daily through an Atlantic cable. But as a misunderstanding has arisen in some minds about the capacity of an Atlantic cable for transmitting a given number of messages in a given time, it may be well to appeal in this matter to credible authority.

Mr. Varley thinks that certainly 12, or, more likely, 16 words, a minute, can be sent across the Atlantic, the copper conductor of the cable not being less than 5 cwt. to the nautical mile. Our last number contained an elaborate letter on this subject, from Mr. Varley. "By experiments," says Professor Thomson, in a letter, bearing date the 10th of November last, "made upon the old Atlantic cable before submergence, and by theoretical investigation, founded upon the principles demonstrated in my letters to Professor Stokes, on the 'Electric Telegraph,' October and November, 1854, and published in the proceedings of the Royal Society, for May, 1855, I am led to feel perfect confidence that a practical working rate of fifteen words per minute could be secured through a new Atlantic cable." Professor Wheatstone, Mr. Fleming Jenkyn, and others, have given similar testimony.

There is not much doubt about the possibility of laying a sound and working cable between Newfoundland and Ireland, and there is still less doubt about its paying, when once laid. The principal question for the moment is, *who* shall do the work? We feel satisfied that it can be done, and will be done, and that soon. If the Atlantic Telegraph Company do not perform it, some other company will. If England does not move in the matter, France will. The Emperor is known to be ambitious to connect his name with great industrial undertakings. Hence the encouragement he gives to tunneling the Alps, and cutting the Isthmus of Suez. Bridging the broad Atlantic with a cable would be a still greater achievement. England has hitherto played the most prominent part in endeavouring to accomplish this work, and we sincerely hope our countrymen will not be deterred in a second attempt, because we have failed once. When the vast commercial advantages involved in the undertaking are considered, we are astonished that the matter has been permitted to sleep so long. The benefits the Governments, and, consequently, the people, of America and Europe, would realize, are incalculable. Antagonistic and irritable feelings, have, for some months' past, found utterance on both sides of the Atlantic. There has been a reciprocity of unenviable compliments passed between the two peoples, which may be the seeds of future angry and expensive disputes. The leading organs of the press, on both sides, have, by mutual exaggeration and recrimination, assisted to produce misconception and estrangement. We wish to see a healthier feeling produced, and we think that an united effort on the part of the peoples and the Governments of the two countries, for an Atlantic telegraph, would lead to such a result.

It would, perhaps, be contrary to true economical science for the Government to give an unconditional guarantee; and, after reflection on the subject, we are led to question the rightfulness of such a policy. But as the Governments would be co-recipients of the advantages from such telegraph, we do not see why they may not be co-workers in its establishment. If the Government were to advance a specified sum to be taken out in work to be subsequently done, or even if the Government, as an encouragement, were to take shares, we do not see that they would be going beyond their legitimate province. Of course they would not do this in the hope of realizing commercial advantage, but for imperial purposes. The Government are, in fact, the proprietors of the principal submarine telegraph in existence. The Malta and Alexandra cable, which is 1,535 statute miles in length, was laid by the Government, and is national property. The main object in laying that cable was to promote more rapid intercourse with our vast Indian empire. In asking the Government to become partial proprietors of another cable, whose existence would be of such importance to the whole interests of civilization, we are only asking them to take another step in the same direction they have already taken. Let the Government, then, only advance one-sixth part of the sum consumed in the Malta and Alexandria cable, towards another for the bed of the Atlantic, the American Government will do likewise, and the great work will soon be done. Every one, we think, must admit that encouragement of some sort should be afforded by Government. The plan we have suggested is, we think, but little liable to objection, and considering the progress of science, the large and increasing demand for telegraphic communication with America, and the momentous issues at stake, we hope and believe that before a few months are passed away, some definite and certain action will be taken towards the accomplishment of the most magnificent industrial enterprize of the nineteenth century.

J. P. E.

Mr. Bullions, an engineer on board her Majesty's ship "Psyche," was killed the other night, at Marseilles, in a *melee*, while his companion Mr. Gray, an engineer belonging to the same vessel, was injured so severely that—according to the latest accounts—his life was despaired of

NAVAL GUN AND ARMOUR EXPERIMENTS AT SHOEBURYNESS.*

[*We are informed by "An Official," that the frames of the target penetrated by the Whitworth shells are the same distance apart as those of the "Warrior." Correcting this slight difference, which amounts to one frame less in the length of 10 ft., he admits that two of the plates, being 5 in. thick, instead of 4½ in., and the target being supported at both ends with solid timber 7 ft. in thickness, the resisting force, and therefore the triumph of the Whitworth projectile, was so much the greater.*]

(Continued from page 325.)

The experiments on Friday, the 14th ult., were marked with peculiar interest. Questions which former trials left in doubt, and which are respectively the subject of totally opposite theories, were submitted to the searching test of cannon balls, and conclusively solved. The comparative penetrating force of smooth bore and rifled guns, the nature of backing to armour plates, the effect of rigid or elastic resistance, and deflection, received a practical elucidation of more value than the profoundest deductions of professional science.

This day's experiments were so imperfectly reported in *The Times*, it is desirable they should be correctly described, the questions they determine referring to a branch of public expenditure of enormous amount.

Our report does not follow the order of the proceedings, but gives every series separately. From one cause or another, and to save time, each set of experiments was not completed by itself, but suspended and resumed as the guns were ready to be discharged.

In these Shoeburyness campaigns, there is more of tactics and manœuvres than might be supposed. The chairman of the Iron Plate Committee commands the movements; the commandant of artillery executes them; a mounted aide-de-camp carries orders to lay and point the guns. Not the least interesting part of the operations is the working and registering of an ingenious, but simple apparatus, for determining the velocities of projectiles, which is under the management of a young officer of the Royal Engineers, who is reputed to be a good mathematician. The apparatus consists of a frame, across which thin copper wires are stretched horizontally in parallel lines, and of a pendulum of which the vibration is measured. The frame is placed a few paces in front of the gun, or the target, accordingly as the initial or impact velocity is required. The wires, which are so close together that the projectile cannot pass between them, are connected with, and act upon the pendulum, by means of an electrical current passing through them. Any one of these wires being broken by the passage of the shot, the pendulum indicates the force of its vibration, and by working out a mathematical formula the velocity of the projectile is ascertained to the 1,000th part of a foot per second.

The main business of the day was the trial of the comparative force of the smooth bore 68-pounder and the 70-pounder rifled Armstrong. This series of experiments was planned by Sir William to support his favourite theory.

It will be remembered that on all previous target trials, and notably those of the "Warrior" section, the 110-pounder rifled Armstrong solid shot were less effective than the old smooth bore 68-pounders. Taught by experience, Sir William has changed the form of the head of his projectile, which, instead of being conical, is now globular, having the rear part cylindrical; and he maintains that the round heads will beat the flat heads. That is a question which remains to be solved; but the trials we are now referring to have proved that the round-headed shot from a rifled gun, has greater penetrative power than the spherical shot from a smooth bore.

The rifled Armstrong and the smooth bore were fired at 200 yards range, against 5-inch plates backed and supported on the plan of the "Warrior," with equal quantities of powder (the service charge of 16 lb.), and equal weights of shot (68-pounders.) The impact velocities obtained by several discharges from both guns, varied from 1,430 to 1,450, and 1,480 ft. per second, and gave the following results. The rifled roundhead made an indentation 8 in. in diameter, and 2·6 to 2·7 in. in penetration, and the spherical smooth bore an indentation of 9 in. diameter and 2 in. penetration, giving the superiority to the former in the proportion of 26 or 27 to 20. The damage to the plate by the former was greater, as shown by circular cracks round the circumference of the indentation, which were not produced by the latter. These trials were fairly conducted, and the results appeared to give much satisfaction to Sir William Armstrong. They have redeemed the character of the rifled shot as a battering projectile, and they show what little dependence is to be placed on experiments, unless all the circumstances under which they are made are carefully considered. The conical nose of the Armstrong 70 and 110-pounders, used in the first experiments, was the cause of their inferior effects, just as the flat head is one of the causes of success of the Whitworth shot and shell. The form of the projectile, it is therefore evident, is of no less importance than the nature of the gun; and, it is equally clear, from the effects of hardened steel, as compared with cast and wrought iron projectiles, that the material of which they are made is an element of the greatest consequence in determining their destructive force. Sir William Armstrong, it is understood, is confident that hard steel round headed shot and shell, on his principle of rifling, will surpass the Whitworth flat heads.

The next series of experiments we have to record refers to backing of armour plates. The effect of artillery on plates depends, perhaps, as much upon the material on which they are bedded, as upon the quality and dimensions of the iron, and the force of the projectiles. Rigidity of backing would appear to be a desideratum, experiments having proved that elasticity aids penetration. Hard wood has been used to support the armour of all the iron-clad ships hitherto constructed; but an impression prevails that a tougher and more unyielding substance might be advantageously substituted for it. Strange to say, paper has been thought to possess these properties, and in the form of millboard was tried on Friday in competition with wood. Two small targets were arranged for this purpose by the Special Committee. These, for distinction, we call A and B. Each consisted of a 1 in. plate, 4 ft. by 3 ft., firmly secured by three vertical iron bars fastened with screw bolts to a timber butt 2 ft. thick upon a backing of 14 in., which for A was composed of sheets of common millboards barely ⅛ in. thick, and for B of teak. With this difference the targets were precisely similar.

No. 1 shot, a 6-pounder Whitworth 5½ in. in length, and 2½ in diameter, was fired at A. It pierced clean through the 1-in. plate, and about 2 in. into the millboard, leaving 2½ in. of its length protruding outside. Its penetration was, therefore, 3 in. No. 2 shot, precisely the same as No. 1, with the same charge and at the same range, was next fired at B target. It passed entirely through the 1-inch plate, making a larger and a ragged hole, and buried itself completely in the teak, which was split through to the top. Fragments of the broken iron were visible 2 or 3 in. inside the orifice of the hole. The extent of penetration could not be ascertained without breaking up the teak, but it certainly was more than double that into the millboard. This result excited some surprise; and as one trial was not considered a sufficient test, the experiment was repeated with a 6-pounder under the same conditions as the former one, and with the same result. A 12-pounder Whitworth was then fired at both targets. In each case the shot pierced through the plate and backing, and so deeply into the timber butt that, without breaking up the latter, the comparative penetration could not be ascertained. The visible difference externally was that the hole in plate B was larger and more ragged than A, showing that the wood backing afforded less support than the millboard, and the fibre of the wood closed behind the projectile, whilst the hole through the sheets of millboard was open, so that a rod could be thrust into it. The presumption from the effect of the two 6-pounders is, that the penetration of the 12-pounder was less into A than into B; and, from the decisive results with the former, we may fairly conclude that the victory rests with paper over wood. This trial was made under conditions unfavourable to the former. The sheets of millboard, which was of inferior quality and loose texture, were placed loosely together without any compression but that of the screw bolts which fastened the supporting iron bars. The resisting force of this material has attracted so much notice that further experiments will be made with hard cardboard of greater density, and it is hoped they will afford still better results. The credit of originating the idea of paper backing is due to Mr. Mallet, who suggested it some time ago. But probably it would not have been tried but for the abolition of the paper duties. Mr. Gladstone, in enumerating the uses to which the article might be applied, little thought that, in combination with iron, it would supplant "wooden walls" and become an essential element in our national defences. We fear we shall be accused of romancing in stating that the hulls of war ships may possibly be constructed of *papier maché*, but the fact is, that such a proposition is seriously mooted in a quarter which commands respect.

The object of the third experiment was to test the plan of a Mr. Felton, who, unaware, apparently, of previous trials of the elastic system, submitted to the Iron Plate Committee a small target, consisting of alternate layers of iron, india-rubber, *and vulcanite*, three plates, ⅜ in. in thickness, being arranged, one at the front and back, and one in the centre, with the elastic materials between them, making a total thickness of 7 in. An iron plate, full 1⅛ in. in thickness, the equivalent in weight, and of the same length and width as Mr. Fenton's target, was prepared by the committee. These small targets were fired at alternately with a 1-lb. wall piece. The shot, which made an indent only 2-10ths in. in the committee's plate, passed through the outer ⅜ in. plate, and penetrated 4½ in. into the body of Mr. Felton's target. Both were then submitted to a severer test, with a 6-pounder Armstrong, a shot from which broke the committee's plate, but failed to pass through it. Another shot from the same gun smashed right through the elastic target, which was completely demolished. This is another example of the inefficiency of an elastic resistance to projectiles, and proves that rigidity is the true principle for the construction of armour.

* Want of space prevented us inserting this last week.—Ed. M. M.

The object of the last of the experiments on Friday was to settle the vexed question of "deflection." Notwithstanding the previous experiments by the committee, which tended to discredit the theory, the advantages of deflection has been so much insisted upon, that they deemed it expedient to set the question at rest by a further and conclusive trial. Two plates, about 4 ft. by 3 ft., and 2½ in. in thickness, were fixed one above the other, on a stout wooden frame, at an angle of 45 deg., and were fired at with Whitworth's 12-pounder elongated hexagonal shot, and a charge of 1¾ lb. of powder. The first two discharges produced no effect on the plate struck, except a mark on the face, not amounting to an indentation, and a slight crack behind.

The shot were supposed to have glanced off. This, however, excited much surprise, when a third shot, of the same kind, being fired against a vertical plate, it was broken up, and proved to be cast-iron. It was then discovered that these were pilot shot, not intended for destructive effect, but only to take the range. The Whitworth hardened steel flat-headed 12-pounder, with a charge of 1¾ lb., was now brought into play. The effect of the first shot was remarkable and decisive. It struck the centre of the upper plate, penetrated through the iron completely, but its entire length did not pass through. The hexagonal twist of the rifling arrested the passage of the projectile, which stuck fast in the plate, one end protruding in front and one behind, fracturing the back of the plate considerably. Another shot of the same description also penetrated the plate, making a hole right through it, but apparently from the same cause of obstruction as the last, it rebounded from the plate, and flew back 25 to 30 yards into a ditch. A third 12-pounder not only penetrated, but passed clean through the plate, and was picked up behind the target.

Every one of these projectiles sped its way in a horizontal line, and straight as an arrow, through the plate, without the slightest deviation from its course. Being of an elongated form, 8 or 9 in. in length, and a little over 3 in. in diameter, with flat heads, they presented the conditions which are regarded by the advocates of the theory as most favourable to deflection, and yet *there was none*. These results leave no doubt that the deduction of the Iron Plate Committee from their former experiments was correct. The effect of an inclined plate is simply to increase the horizontal thickness to be penetrated by the shot, and the increase is in proportion to the angle of inclination. Practically, a given weight of plate with a given vertical height, placed vertically or inclined, offers the same resistance, so that nothing is gained by the angular arrangement devised by Mr. Jones, of Liverpool, applied to the "Merrimac," and proposed for the cupola ships, or even from the round tower principle. It follows that the common notion of deflection is an error. Abstractedly, the resisting force or a plate is in proportion to its thickness. What is called deflection exists only when the penetrating force is insufficient, in which case repulsion takes place at an angle, and is called deflection, if the line of the blow is not perpendicular to the plane of the surface struck. If the projectile force is sufficient for penetration, there is no deflection, and there is no rebound.

The Iron Plate Committee have done good service in clearing up this question, which has given rise to so much discussion, and created notions of a defensive system which, if our conclusions are correct, will prove to be delusive.

DEEP-SEA TELEGRAPHY.

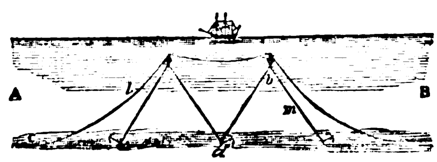
TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Sir,—I have to request the favour of your inserting in the Mechanics' Magazine the following proposals for overcoming some of the most formidable difficulties by which deep-sea telegraphy has heretofore been beset, premising that they have already been embodied in a communication addressed by me to the chairman of the Atlantic Telegraph Company.

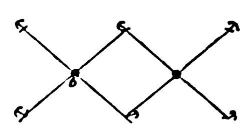
I believe I am correct in stating that, in all deep-sea lines, the risk of failure and the attendant amount of pecuniary loss increase directly with the distance to be traversed at a single stretch; the rupture, either of the conducting wire or insulating covering, being fatal and irremediable.

I propose materially to diminish the danger to which a submerged cable is liable, and altogether to preclude such a calamity as its entire loss through injury sustained at one or more points, by the simple expedient of *anchoring* air-tight metallic buoys, in pairs, at long intervals, of from 50 to 200 miles, and attaching them by lines to the telegraphic cable in such manner that, whilst both buoys and lines shall be raised near enough to the surface to be within easy grappling range, they shall be beyond the influence of tidal or other superficial disturbing agencies; each buoy, moreover, being so far separated from its fellow as to enable a ship to hit off the interval with readiness in favourable weather.

The subjoined diagram, representing an extreme case as regards depth, will, perhaps, serve to convey my meaning more clearly than mere descriptions :—



Let A B represent a vertical section of the sea, the depth being 1,760 fathoms, or about a couple of miles; *b b*, a pair of buoys, of sufficient size to support not only their own mooring lines, *m m*, but likewise the line, *l l*, suspended by them and attached to the telegraphic cable at *c c*. Here the two buoys are moored to three anchors, resting in a linear series, the centre anchor giving attachment to two of the mooring lines. As this might, however, allow a certain degree of oscillation, it would, perhaps, be more desirable to employ a double series of moorings, six anchors, instead of three, being laid down, so as to form two parallelograms, above the centre of which the buoys, *b b*, would then be securely retained in a fixed position, as shown below :—



Without, however, discussing minor details, as to the distances by which the buoys should be separated from each other and from the next series, the most efficient mode of mooring, and the expedients for determining the precise portion of the suspended line which may happen to be struck by the grappling iron, and clearing it from the buoys without risk of fouling the moorings, I trust I have said enough to show that my scheme is neither chimerical nor hampered by any doubtful conditions beyond those incident on its cost.

It may prove an expensive addition to the already costly machinery of deep-sea telegraphy. But I have only to request those who adduce this objection to "remember Lot's wife"—in the shape of half-a-million's worth of cable laying dormant at the bottom of the Atlantic. I presume the outlay incurred in a system of buoyancy such as I advocate, even had it added another £20,000 to the gross expenditure, would be deemed a first-rate investment, were but half the lost cable thus rendered recoverable.

In conclusion, I would observe that the novel and leading feature in my system of buoying consists in its being effected, not from the surface of the sea, but *from the bottom*; thereby avoiding all disturbing influences, offering the greatest facilities for permanently suspending from the bottom such portions of the *cable itself* as may have to traverse abrasive or otherwise dangerous tracts, and, virtually, yielding the advantages of a series of short lengths.

I am, sir, &c.

G. C. Wallich.

17, Campden Hill-road, Kensington.
December 3, 1862.

ON THE INFLUENCE OF SCIENCE ON COMMON LIFE.

Some time since Baron Liebig delivered an address before the Academy of Science, of Munich, on the "Influence of Science on every day Life." The speech was in every way worthy of the reputation of the great German philosopher, who, from the solitude his laboratory at Giessen, has exercised such an influence on the destiny of the age.

But few men in practical life (says Baron Liebig) and engaged in applying the results of pure science to their own special requirements, are in a position to recognize the exact way in which science has increased their riches and extended their powers. When chemistry, however, is seen to furnish the farmer with recipes for manures applicable to all soils, or with remedies against the potato disease or vermin, or the blight and rot of wheat, but few men can still remain ignorant of the true source of these improvements. Pure science, nevertheless, does not work for the few, but for the many; it works, in fact, for all mankind. The domains of science are founded on the great truths that govern and direct mankind; science enquires whether existing beliefs answer to the laws of nature and of reason, and it replaces imperfection by completeness. Science transforms and improves the knowledge of man, but each intellectual stage requires ages for its completion, and generations are born and pass away before old errors give place to newly-discovered truths.

The roots of a plant draw nourishment from the earth if it be sufficiently diluted with water, but the plant is killed by concentrated food. Heat and sunlight also must lend their aid that the seed may in time increase into the fruit-bearing tree. A similar law of nature has sway over the growth of ideas in the mind of man. An abstract notion, although of itself a fruit, is not the fruit-bearing tree, but rather its seed, and, also like the tree, it requires warmth and culture and suitable nourishment that it may fructify in its turn. There are ideas that will rouse up for a time whole nations, but they pass away, leaving no trace behind. They die away like the green bough of a tropical tree placed in water. It gives forth leaves and flowers, but having no root in the ground can never bear fruit. The fruits of progress enjoyed by the present have their roots in past generations, and the new truths that we acquire will only bear fruit in our children's time.

The slightest improvement in any trade requires time before it can find its way amongst the mass of mankind. The simple idea of using phosphorus to kindle a light, originated in the middle of the last century. It has taken 50 years to produce practical results from the experiments, aiming at the use of gunpowder in a closed chamber; this being the basis of **all (?) the late improvements in fire-arms.**

Ruling error is so difficult to overcome, because it is received as truth by the majority of mankind. This is not, however, the only reason that a truth makes its way so slowly into common acceptance. Habit, want of thought, and the inborn dislike of mankind to the exercise of their intellectual powers, are impediments of no less importance. The most ignorant labourer knows that the raindrops, falling on his dung-heap, bring with them silver pieces. He knows that the refuse, sweltering in the ditches of his village, and poisoning the air, would fructify his corn fields. He, nevertheless, stands by with indifference, like his father before him, and, for the same reason, because things were the same in the good old time. In the same way (continues Liebig), the municipalities of large cities spend annually immense sums on their sewerage. They put **the means of reproducing the bread of millions beyond the reach of the farmer. The farmers look on this with indifference. They however think it a praiseworthy undertaking to fetch the same elements from America, several thousands of miles away.**

The growth and extension of better views as to these matters require time. This increase of knowledge will result in the increase of human power, and favourable circumstances may in some cases hasten its development. If education has not given to any nation a power to examine and select the teachings of science, then the attempts of the enlightened few are lost in trying to apply these truths, and they are rejected by the masses as something strange and unheard of.

In such a country, even if Wisdom herself were to go from house to house offering her services, the poorest of the land would reject her in their folly. They would say that her help was importunate, that it was not wanted, that they knew enough, and were in want of other things than mere knowledge.

There are plenty of instances of farmers, even men of education, having refused to try experiments with artificial manures that had been offered them for this purpose by agricultural societies. They wished to have them gratis, and to be thanked for using them.

Such a state of things, however, is passing away. It is impossible for a nation to refuse to advance, and to reject the power and wealth in the gift of science. That God, in His own good time, causes the seed to ripen, and that the True and the Good are imperishable, remain as eternal truths.

But, even in countries where the truths of science are willingly received, the men who most put them to use are often ignorant as to their source. When, after years of opposition, a scientific truth gets into general acceptance, the generation that has grown up in the midst of these new ideas is unaware that they result from a series of gigantic labours. The telegraphic clerk is little aware that the small apparatus he works is the result of toilsome research by hundreds of sagacious minds during half a century. He little knows that it embodies a series of facts that required to be discovered and established before even the idea of the apparatus by means of which he fills a useful and comfortable position in society could take its rise.

The fresh generation believes that the present state of things has always existed; it cannot believe that things now received as intelligible, true, and useful, have been scouted as useless, **false, and unintelligible. The great mass of** mankind has no comprehension of the difficulties that accompany researches for extending the domains of science. It may even be said that the inborn love of men, in general, **for truth would not suffice to overcome the difficulties in the way to any great result, did not this impulse rise to the dignity of a passion in the breasts of the votaries of science—a passion giving force and increase to the power of their intellect. Such researches are undertaken without hope of gain, or even of thanks.** The successful man in these researches has but seldom the good fortune to reap their useful application; he cannot sell his harvest in the market of life, for it is without price; and it cannot be made to order, nor can it be bought,

Even the most powerful influences of science on man's mind and every-day life, are so slow and gradual in their progress, as to be scarcely noticed by the superficial observer. But the enlightened man knows that no world progress is possible without the aid of science. He knows that the reproaches directed against the practical usefulness of theoretical knowledge fall on society, and not on men of science. Such men follow, undisturbed, their career, without anxiety as to the future usefulness of their works; a usefulness not bounded by the frontier lines of a single state, but covering the whole universe in its expanse.

IRON WALLS AND NAVAL GUNS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—The fear of exciting in the minds of your readers that utter disgust, which, according to our great poet, is created by "damnable iteration," has deterred me from noticing the diatribes of some of your correspondents, who seem to think more of dreamy and inexplicable theories, than of practice and facts. If I engaged in a contest with such adversaries, I should imitate Don Quixote, who converted windmills into giant warriors, imbued with intelligence; and harmless sheep into armed batallions. The worst punishment that could be inflicted upon those writers would be to print their letters, which I conclude, in pity to them, and in mercy to your readers, you have declined to do. I leave to the theoretical and ponderous Mr. Cheverton the luxury of the last word, and I respect the undiscriminating wrath of Mr. Thos. Gale, whose indignation against the Admiralty for refusing to adopt his wooden "steam ram," makes him commit the eccentric blunder of classing "Civilian" among the supporters of that inscrutable department; when Mr. Gale ought to know, from the whole tenor and arguments of the letters on "Iron Walls," that precisely the reverse is the case. Without any further notice of individual criticism, I will apply myself to some important points at issue in the controversy on guns and armour.

DEFLECTION.

The vulgar notion of deflection is that an inclined or angulated surface possesses or creates a repelling power. If that is not the sense in which deflection is advocated as a means of resistance to penetration, I shall be glad if any of its supporters—Mr. Jones, Mr. Richardson, Capt. Coles, or others—not for my enlightenment, but for the benefit of the public, will expound their theory. Unless they abandon it, they are bound to respond to this challenge.

Not to shirk the question myself, I affirm that, in the sense above described, deflection is—I cannot call it a *power*—an imaginary source of causation. It may, I think, be properly described as angular or diagonal repulsion. If a projectile be thrown against the level surface of a body which it cannot penetrate in a line perpendicular to the plane of the latter, it will rebound on the same line. If the line of projection be at an angle to the surface, or if the surface itself be angulated or inclined, the projectile—the force being insufficient for penetration—will rebound at an angle. This action or result is called deflection, and the phenomenon, as we see it exemplified in the games of tennis, or billiards, has come to be regarded as a proof that the force of the blow is diminished or warded off, because it appears to glance aside. But is it possible that either the line of direction of the projectile or the position of the plane which receives the impact can alter the force of penetration or resistance? The absurdity of this proposition, when the former force is greater than the latter, becomes more obvious.

Applying this rule to projectiles hurled against iron plates, I venture to form the following conclusions:—If the projectile force be sufficient to penetrate the plate, there will be no deflection. The plate will be pierced through and through in a straight line, whether it receive the impact perpendicularly to the surface or at an angle. If the penetrating force be insufficient—that is to say, if the plate repel the projectile—the repulsion will be in the same degree whether the plate be struck point-blank or obliquely. This opinion may be regarded as a scientific heresy or a theoretic blunder; but I appeal to facts as demonstrated by the experiments of the Iron Plate Committee. The increased thickness of plate to be traversed in a horizontal line, if it be inclined instead of perpendicular, is another question, which resolves itself into the fact that, *cæteris parabus*, a greater penetrating force is required, so that the plate will repel or stop the projectile, but that is not what is meant by the disciples of the deflection school.

Coming to the practical view of the object of an inclined surface of iron plate for fortification, we must look to the vertical height of the defensive wall; and we find that taking the same quantity, and therefore the same weight of iron, the thickness of the plate must be diminished in proportion to the increased length of the incline, as compared with the height of the vertical plate, and that thus the supposed advantage of the so-called deflective principle is neutralized. I shall not at present carry the exposition of this point further. I believe, I am prepared to prove that, not only is there no gain, but there is a positive loss of resisting force, in applying a given quantity of iron for fortification in an inclined instead of in a perpendicular position.

PENETRATION.

The punching process, with which I have familiarized artillerists and engineers, as an apt illustration of the effects of ordnance on iron plates, gives us the law which regulates those effects. Some great authorities, amongst them Sir William Armstrong, have denied the correctness of the comparison. So shrewd a man, and one so ready to abandon any method when he finds a better, as well as other sceptics, will no doubt change their opinion and acknowledge the theory that, to pierce a plate with shot or shell is nothing more or less than to drive a punch through it with the force of gunpowder. This being so, all doubt and uncertainty as to the rule for resisting artillery with iron fortifications are removed. To punch through a plate, two preliminary conditions are required—sufficient penetrative force and hardness, combined with cohesive strength in the material of the punch, superior to those properties in the plate. The first is a *sine qua non*, and is assumed to exist in all my arguments. The law of penetrative force of a projectile, which appears to be determined to the satisfaction of artillerists, is represented to be its weight multiplied by the square of its velocity, which is regulated by the charge of powder. Here we have an intelligible formula which anybody can work out. As to the second point, we need only to reflect upon the established practice of using a steel punch to perforate boiler plates, and the results obtained by the Whitworth bolts, to be satisfied that it is as imperative as the first.

Having settled the conditions precedent, w

come to the punching law, which determines that you must make the resisting strength of your armour greater in effective thickness than the diameter of the projectile. If you do that, you will resist the penetrating effect. The *effective* thickness may be composed of the absolute thickness of the external armour plate proper, by itself, or of the latter thickness, fortified by the backing on which the armour plate is bedded. As the medium of so fortifying the plate, I have so often and so emphatically condemned wood, that it has been designated my "crotchet," or "hobby;" but, in sober seriousness, I will ask, can *wood* offer any adequate resistance to the bulge of the armour plate at the back of the area of impact, or impart any efficient local strength to the plate? If you adopt an elastic or yielding backing, and reject a hardened rigid one, you are brought to this dilemna—you facilitate penetration.

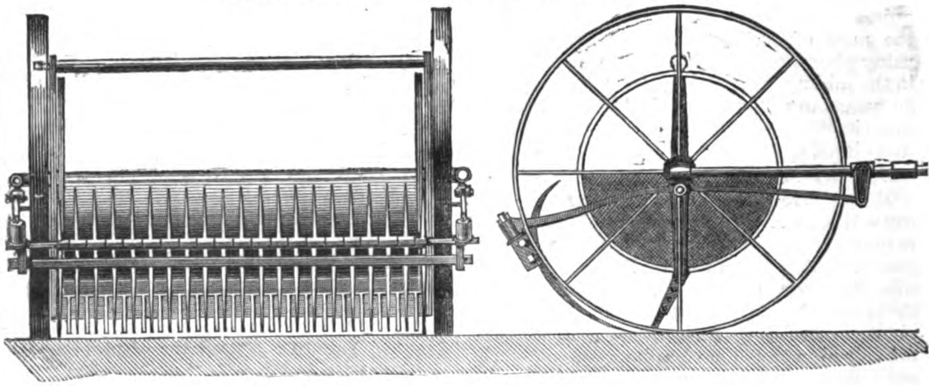
For the moment I will pause, that my contradictors may reflect upon and digest that proposition. I have been twitted with the mania of demolishing theories, without propounding one of my own. I have long had one under my notice, but I have abstained from submitting it to public discussion, for the sufficient and sincere reason that, in promoting a controversy on naval armour, in your columns, I was as much at sea on the true principles of its construction as all the world; and being, as I acknowledged from the first, unscientific, and unprofessional, I was diffident of my own opinion, and undecided as to the real merit of a system which appeared to offer some advantages. Numerous experiments, however, have thrown light on the subject, and in an early number of your invaluable journal —invaluable as the field of free discussion on science, arts, and manufactures—the system referred to shall be submitted to the criticisms, which I have so freely, and, I fear, sometimes, in the heat of argument, so unceremoniously exercised upon other plans. I hope I have given offence to nobody. I have sometimes retorted when I have been assailed, but in these controversies we must give and take.

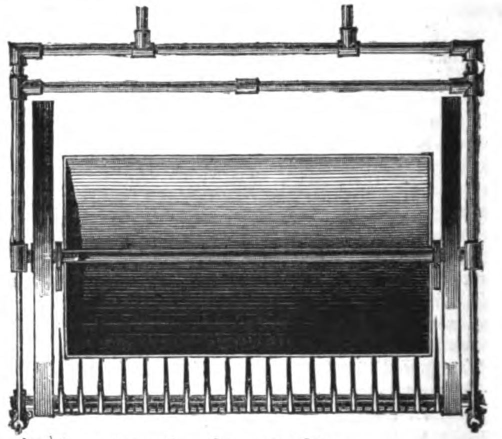
CIVILIAN.

NEW PRINCIPLE OF SHIPBUILDING.

On Monday last a vessel was launched from the yard of Mr. J. Robinson, Duke's Dock, Liverpool, in which a new and important principle in shipbuilding has been introduced, and which has attracted considerable attention amongst gentlemen interested in the trade. The vessel draws about 2½ ft. of water, will be able to proceed to sea without any ballast, and will take the ground with perfect safety. She has the peculiarity of being almost flat-bottomed, and from this and other things she is expected to be capable of carrying a very large quantity of cargo in proportion to her tonnage. Her bilge will take the ground at the same time as her keel, which is planked of wood 10 in. in thickness. Her dimensions are—length, 100 ft.; breadth, 22 ft.; depth, 12 ft. 3 in.; and she will carry 440 tons dead weight at a draught of about 11 ft. She will be rigged as a brigantine with wire rope manufactured by Messrs. Garnock, Bibby, and Co., of Liverpool, but the mainsail will not have any "gaff," the head of the mainsail hoisting up to the head of the mainmast, and gaff-topsail from the head of the maintopmast to the end of the main boom, which it is considered will be an improvement, and add to the vessel's sailing powers. The vessel is intended for the conveyance of machinery, and has an exceedingly large hatch with two beams at the end close together, with a large iron rod passing through timbers and screwed on a large iron plate, which makes the beams of the requisite strength without the introduction of stanchions. The vessel has been built in a very short time, and Mr. Robinson states that he could build a ship of 500 tons of the same model in six weeks, with the same number of hands that he is now employing. The vessel is the property of the builder, who is the owner of other vessels, and has experienced the difficulty of vessels built on the old model of entering ports where there is shallow water—a difficulty which he thinks this vessel will obviate. The launch was effected in capital style, the vessel gliding gracefully into her future element amid the applause fo the spectators.

DRUMMOND'S PATENT REVOLVING RAKE.





DRUMMOND'S PATENT REVOLVING RAKE.

A patent has just been obtained by Mr. P. R. Drummond, of Perth, N.B., for a revolving rake. The accompanying engravings represent the invention. The implement is intended for lifting objects, such as stones, hay, felt, corn rakings, turnips, potatoes, or soil from the ground into a cart without the aid of the human hand.

This is accomplished in the following way:—A cart, similar to the common two-wheeled cart, has a rake very nearly the same as the common horse rake trailing behind, the teeth of which have the same circle as the periphery of the cart wheel, and is drawn forward exactly between them. The shafts of the cart are fixed outside the wheels, and between the wheels and the cart two arms are carried round on the same centre, between which the revolving rake is fixed. Thus, as the cart is drawn forward, the teeth of the revolving rake are carried round the cart from front to back and upwards between the teeth of the trailing rake, carrying whatever substance may be collected on them, and when the revolving rake reaches the centre of the cart the teeth gravitate and drop their contents into the cart, and then pass on at the pleasure of the conductor. A revolving rake for the purpose described, and similar in principle, was exhibited in the eastern annex of the International Exhibition.

SOLID DRAWN GUN BARRELS.

On Tuesday, by the permission of the court of the company, some very interesting experiments were made at the proof-house of the Gunmakers' Company, Whitechapel, on a fowling piece and rifle barrel made by the new process of solid cold-drawing, of which Messrs. Christoph, Harding, and Hawksworth, are the patentees. By this process the metal is drawn cold by means of the hydrostatic ram, and thus a saving is effected to the extent of one-half the metal now consumed by the hot process. For instance, about 10 lbs. of metal is now used in making an Enfield rifle barrel, which when made weighs only about 4¾lb., the remainder of the metal being consumed in the manufacture. By the present process two rifle barrels can be drawn from the same amount of metal, equally strong in every respect to those now made. The barrels tried that morning were drawn from a new kind of cast steel, and subjected to the following proofs:—

Rifle Barrel.

First proof......	7½ drachms of powder 2 wads 1 ball of 520 grains ...	No effect
Second proof...	Same powder 2 balls	No effect.
Third proof ...	10 drachms of powder 3 balls	No effect.
Fourth proof...	15 drachms of powder 5 balls	No effect.

The fowling piece was put to the following proofs:—

First proof......	10¾ drachms of powder 2 wads 1 round ball of 24 to the pound	No effect.
Second proof...	Same powder 2 wads 2 round balls	No effect.

It was then determined to burst this barrel by putting in a proof charge and two balls, then cramming the muzzle of the barrel to the extent of two inches with moist clay. The result was, that the barrel burst at the bottom of the clay, only tearing off about two inches of its length, and showing no other signs of injury. A similar barrel, proved at Birmingham, only slightly bulged, with twenty drachms of powder and three balls.

Among the party present were Mr. Patchett and Mr. Bond, the eminent gunmakers, Major, General Willoughby, C.B., Colonel Sale, J. Thornton, Esq., R. Pownsett, Mr. G. Latham Browne, Lieutenant Hardinge Browne, R.A., Mr. J. J. Burnett, and the patentees. Several specimens were also exhibited, showing the applicability of this process to drawing hollow tubes in iron or steel, of any shape, and almost any reasonable length. At present we understand it has not been applied to tubes of more than 1⅜-in. diameter, or to a length exceeding 30 ft. Its extension to larger tubes is evidently a mere question of mechanical power. The patentees estimate that, by the adoption of their process, the cost of iron gun barrels will be reduced to one third, and that a cast steel barrel can be supplied at the present cost of an iron one.—*Standard.*

The Paris journals announce the decease at Trouville, where he generally resided, of M. Mosin, marine painter. He was in his 56th year.

BOBY'S IMPROVED LAND ROLLER.

FIG. 1.

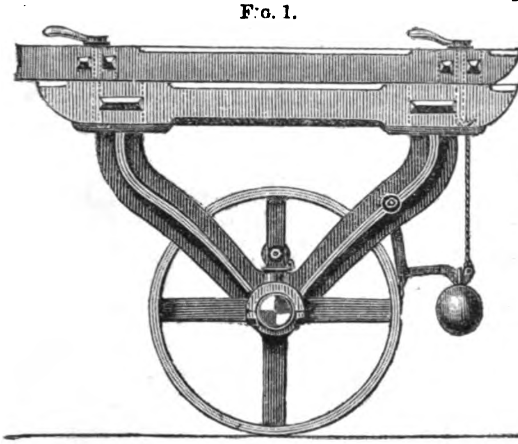
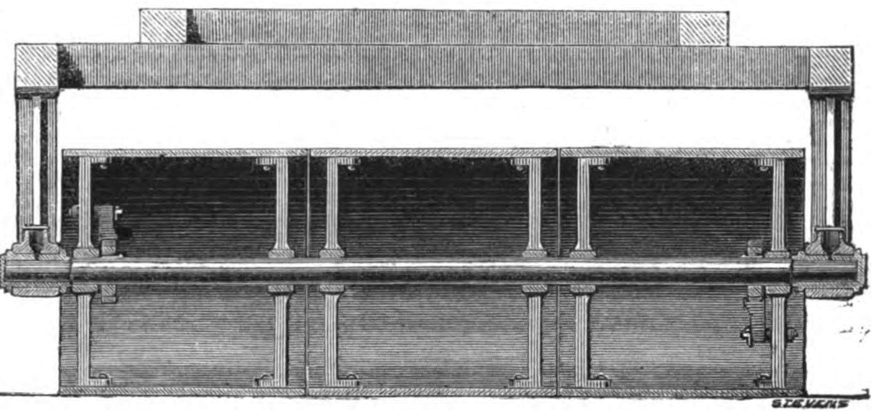


FIG. 2.

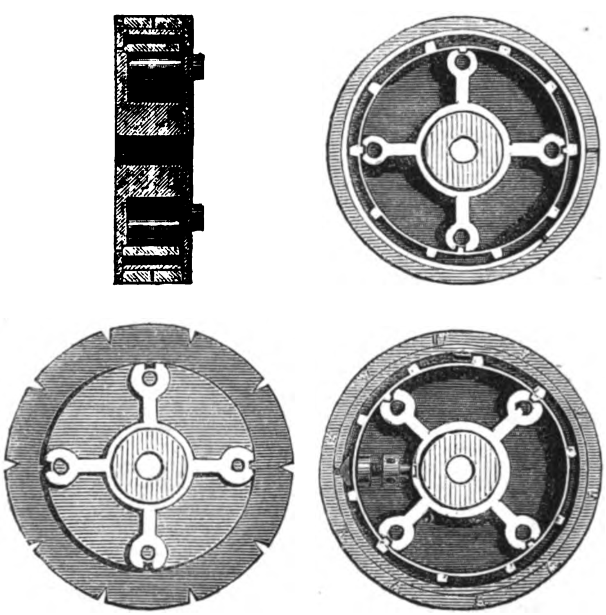


BOBY'S IMPROVED LAND ROLLER.

MR. R. BOBY, of Bury St. Edmund's, so well known for his corn screen, has just obtained a patent for an improved roller for crushing land. The invention relates to a novel mode of mounting and arranging the several parts, so that the friction of the working parts, and the power required to draw the implements over the land, may be reduced. The above engravings illustrate the apparatus. Fig 1. is an end elevation; and Fig. 2 a longitudinal section of the same.

The axle on which the rollers or pressing wheels are mounted, turns in properly lubricated bearings or grease boxes, so that it may rotate therein with as little friction as possible. If the roller or clod crusher be composed of two or more parts, or pressing surfaces, one or more of the parts of wheels may, if desired, be permanently or temporarily attached to the axletree or spindle by means of ratchet wheels, wedges, or other analogous contrivances. The axle or spindle will be obliged to turn in its bearings, but the ratchet attachments of the rollers will allow the latter, when passing round curves, or when the implement is being turned round at the end of the field, to turn back or rotate on the spindle. By this arrangement the friction of the working parts will be reduced to a minimum, and the power required for drawing the implement over the land will be materially lessened. The crosses or arms of the rollers are provided with bushes or pairs of bearings, so that should any part be worn away, the damaged part may be removed and replaced by a sound one.

SCOVILLE'S PATENT PISTONS FOR ENGINES.



SCOVILLE'S PATENT PISTONS FOR ENGINES.

THE accompanying engravings show an improvement in pistons for steam-engines, recently patented by Mr. G. Scoville, of Furnival's Inn.

The object of this invention is to simplify and perfect the use and application of metallic packing for pistons of steam-engines, and to dispense with the use of springs or other mechanical contrivances for adjusting the regulating such packing. This object is effected by substituting steam by means of a simple mechanical arrangement for the springs or equivalent mechanical contrivances usually employed for the purpose. Instead of the rings in common use in locomotive pistons, which are ordinarily made of brass and Babbitt metal, and are consequently very expensive, cast-iron rings may be used. As the rings in common use are so well known, it will only be necessary to say that in locomotive engines ordinarily the two outside rings are made alike about three-quarters of an inch thick, and wide enough so that the two when in position will fill the space between the flange of the piston head and the follower, and work freely. Each ring is severed or cut across diagonally, so as to allow expansion when pressed upon from the inside. The inside ring in the piston of the ordinary locomotive engine is usually one quarter of an inch thick, and of the same width as both the outside rings, cut open in the same manner, and when in position between the flange of the piston head and the follower, rests on the inside surface of the outside rings, the openings in all the rings being at different places, so as to break joints. Instead of springs or any other mechanical contrivance for pressing the rings out against the cylinder a fourth ring of cast iron or other metal is employed, and may be termed a valve ring. This ring is placed within the inside ring; the width of this valve ring when finished is a very little less than the distance between the flange of the piston head and the follower, say one thirty-second of an inch less, and it is turned off on the edges in a lathe. This valve ring is made with bosses on the outside, and large enough, so that when in position the bosses will touch the inside ring. The object of these bosses is to strengthen the valve ring without making it heavy, and to form spaces between the valve ring and the inside ring, so as to allow the free action of the steam on the inside ring, and at the same time to support the valve ring, while resting on the inside, ring holes are made in the flange ring for the admission of steam into the spaces behind the packing rings. It will be obvious that as the steam is let into one end of the cylinder it will pass through the small holes in the flange of the piston head or follower, opening against the bosses on the valve ring, and pressing the valve ring over against the holes on the opposite side, it will thus close those holes and be prevented from escaping or blowing through; the pressure of the steam must consequently be exerted on the inside ring, and thereby be brought to bear upon the outside rings and cause them to expand against the side of the cylinder, and forming a perfectly fitting piston. When the piston is forced to the other end of the cylinder, and the steam is let in at that end, the action of the valve ring is reversed, and the pressure of the steam on the rings is exerted from the other side of the piston head. Thus the valve ring, in its operation with the holes above described through the piston flange and follower, is simply a valve or series of valves for the purpose of admitting steam into the piston head, and is made in the form aforesaid so as to present a considerable surface against the flange of the piston head and the follower, to prevent wear. The valve ring may be made with a flange on each end of the same width as the combined thickness of the ring and boss, with holes through the ring between the bosses to allow the free passage of steam to and against the inside ring. The advantages of this invention herein described consist in its being easily and cheaply applied to the packing of pistons in steam-engines already made in the ordinary way with springs, and in securing a uniform and even pressure upon the rings that form the packing of the piston, causing them to wear smoothly and evenly, not cutting the cylinders, and consequently lasting much longer than the metallic packing in ordinary use. It is also durable and not liable to get out of order, and is peculiarly valuable in locomotive engines, as when running down gradients or whenever the steam is shut off; the piston works freely and without friction, as is not the case when the packing is set out by any other means than the steam itself.

THE COMPARATIVE ADVANTAGES OF FIXED AND MOVEABLE STEAM-POWER, AND OF SINGLE OR DOUBLE DRESSING THRASHING MACHINES.

By R. Vallentine.

PRIZE ESSAY.

The comparative advantages of fixed or moveable steam-power obviously depend very much upon a variety of special circumstances. On large scattered farms, having several sets of out-buildings at which straw would be required, a portable engine will of course be most suitable, if not indispensably necessary; and where steam-cultivation is also to be carried on, there would be a double advantage in the power being moveable. On some large farms, however, having central buildings, in which a great deal of thrashing is done besides grinding, chaff-cutting, &c., so as nearly to occupy an engine, a fixed power will prove most economical, even although steam cultivation be carried on by a separate moveable power. But generally, where a portable engine can be made fully available for both thrashing and cultivation, the cost of both operations is very much reduced by dividing between them the first outlay and percentage of maintenance, instead of these being all charged to either the corn thrashed or the land cultivated. Instances are numerous where in practice one moveable engine is thus found sufficient for every purpose required. Again, there are many farms provided with two sets of buildings which require a good deal of thrashing at each. In such cases, if letting out for hire be not contemplated, I think a moveable engine with fixed thrashing machines preferable to one moveable machine; since besides other important advantages, to be described afterwards, two fixed thrashing parts cost no more than one portable machine, whilst the cost of maintenance is much less.

Personal experience with every variety of steam thrashing machine falls to the lot of few, if to any; although personal experience of the use of some machines, and the observation of others, are possible enough. From all I have seen, and the chief of what I have heard, double-dressing machines, or rather those which are intended for dressing the corn so as to prepare it at once for market, do not succeed. There are times when the corn to be thrashed is of very uniform quality and condition, when a very fair and well-dressed sample may be obtained by blowing out a great deal of offal and light corn, with some that is good; but, as a rule, the attempt to turn out the corn ready for market from the thrashing machine is attended with loss. With the best engine-driver and the best feeder, there are times when the machinery goes slower than is desirable for driving all the light corn and short straws out of the bulk: it is then impossible to have the corn in marketable order. Again, the tops and bottoms of stacks are frequently more damp than the middle; the quality of the corn in the stack also frequently varies. Under such circumstances it is impossible to obtain an average sample unless the whole is turned into a heap, and mixed by subsequent dressing or dressings. There is also an objection to the complexity of most of those machines which are professedly intended to dress and sack up the corn for market. There is always a liability to something going wrong, and however slight the damage or disorder which takes place, the waste of time and labour incidental to frequent short stoppages may be greater than that caused by a long interruption at distant intervals. So liable, indeed, are some of those complicated machines to get out of order somewhere or other, that in one instance I have known a whole winter to pass over, including many days of thrashing, without the work being kept on regularly for even one day free from some vexatious stoppage! Few machines are so very bad as this; but many give great trouble. Moveable dressing-machines are also less serviceable than single blowers, on account of their increased weight. Some compact six horse-power single-dressing thrashing machines weigh only 45 cwt., whilst some of those huge do-every-thing machines weigh $3\frac{1}{2}$ tons. There are people to be found who stick so pertinaceously to any favourite of their adoption, that they will contend that steam power is cheaper than hand labour for dressing corn, or, indeed, any purpose. This corn-dressing is, however, rather a nice operation, and requires more care and discrimination than mere power. A double-dressing machine, as a fixture, is much to be preferred to portable machines, although it is only rarely that an equal sample can be obtained, especially of wheat, from the machine, without a due mixture of the whole bulk.

A fixed thrashing-machine placed on a loft 8 ft. high, admits of double-dressing the corn, without the necessity of elevators, revolving screen, or such like complicated machinery; and, although a further hand-dressing may still be necessary, this is much easier done well than when only a single dressing has been effected by power, or a mere separation of the chaff and corn made.

On the great bulk of arable farms, where steam cultivation is not in progress or contemplated, a fixed steam-engine is comparatively much better than a moveable power. First, the cost of a fixture is less than that of a moveable engine, in the proportion of 3 to 4, according to the prices of the leading makers. A fixed engine costs about £25 per horse-power, whilst a portable engine costs about £33. The price of a fixed thrashing-machine, as compared with a moveable one, is as 1 to 2; fixed thrashing-machines being made by several firms at £8 per horse-power, whilst portable machines usually cost from £16 to £18 per horse-power The difference, therefore, in purchasing a fixed or moveable engine, say of 6 or 8 horse-power, would stand about thus:—

Fixed Engine and Machine.

6 horse-power engine, at £25	£150	0
Ditto machine, at £8	48	0
	£198	0

Portable Engine, &c.

Engine, 6 horse-power, at £33	£198	0
Machine, at £16	96	0
	£294	0
Deduct cost of fixed engine, &c.	198	0
Extra cost of portable engine, &c.	£96	0

Thus, in round numbers, there is a difference of £100 when the moveable engine, &c., is of 6 horse-power; and the same relative costs hold good for any higher power, although the price per horse-power is less as the size and power are increased. For simplicity of calculation, I shall take the above statement of a 6 horse-power engine for estimating the cost of maintenance. Two years ago I put up a fixed engine on this farm, the working of which, &c., I shall by and by describe. After thrashing out two crops of about 120 acres each, the engine seems as good as new, and has cost nothing whatever for repairs of any kind. I allude to this merely to show that estimates on the cost of maintenance of engines generally cannot be fairly based on personal experience alone. My calculations will, therefore, refer to a number of engines, both fixed and portable, which have been working in various parts of the country for from ten to twenty years. Some of the fixed engines have worked for twenty years, and the portable engines from eight to twelve years. Fixed engines generally require a new boiler every ten or fifteen years, with a small outlay for very moderate repairs and new brasses. The average cost of maintenance for several fixed engines, which have worked about six months in the year, has been about 10 per cent. Portable engines are, however, well known to be extremely costly articles for repairs, and those who have worked them six years and upwards tell me that the cost of maintenance is fully 20 per cent. This seems a high allowance, certainly; but then it is necessary to remember that engines which travel about the country, and are in nearly constant work, with rough usage, must suffer more than would be the case with an engine confined to one farm, worked less, and taken more care of. With portable engines, there is seldom much cost for repairs for a few years; but, as the saying is, "when once they begin to go, there is no end to their wants." From their construction, however much care may be taken of them, they are sure to require more repairs than fixtures. The fire-box, tubes, brasses, &c., wear out sooner, besides being more costly for repairs than the more solid parts of a fixed engine. The estimate of 20 per cent. for maintenance certainly seems a high one; but as this is the sum stated as barely sufficient by those who have had much experience in the matter, it may be fairly adopted as a basis of calculation. Let us, then, put together the prime cost and the cost of maintenance of the fixed engine, and contrast that sum with the cost of the moveable machinery, so as to show at one glance the comparison between the two:—

Fixed Machinery.

6-horse power engine and machine, say	£200	0
Cost of maintenance at 10 per cent.	20	0
	£220	0

Moveable Machinery.

Engine and machine, say	£300	0
Cost of maintenance at 20 per cent.	60	0
	£360	0

According to this statement, the relative first cost of a fixed and moveable engine is as 2 to 3, and the relative cost of maintenance as 1 to 3, which shows the great comparative economy of fixed over moveable engines where the one can be substituted for the other. Indeed, so great is the difference that the cost of thrashing on most farms would be more than doubled per year by using a moveable instead of a fixed engine. Those who let out machines for hire do not on an average make large profits, although the number of quarters of wheat thrashed in a year necessarily much exceeds the produce of a single farm. This great amount of work, however, must cause a proportionately greater amount of tear and wear than would arise on any ordinary farm. I think, therefore, that such a calculation as 20 per cent. for repairs and depreciation of value must be too much if applied to the work on one farm, unless the engine was kept almost constantly at work in grinding and other tasks besides thrashing.

On any farm where as much as from 300 to 600 quarters of corn is grown, the erection of a fixed engine would be far more economical than hiring. My own farm produces generally from 400 to 600 quarters annually; for several years I hired a 6 horse-power engine and machine to thrash at 1s. per quarter. The owner of the machine found an engineer and feeder, who had to be boarded during the thrashing. The engine, which had to be brought an average distance of four miles, weighed with the machine $5\frac{1}{2}$ tons, and required six horses to bring it out of fields and along indifferent roads. The machine sometimes thrashed 40 quarters of reaped wheat a-day, but seldom more than 20 quarters of strong bagged or mown wheat; of barley, from 20 to 30 quarters, and of oats from 30 to 50 quarters, per day. There were, however, days lost and parts of days, which materially reduced the average of a day's thrashing throughout the season. So much was this the case, that reckoning every day when the fire was lighted, the average of corn of all kinds, taken together, thrashed in 26 days, was only 20 quarters. The cost of labour, when thrashing by a moveable machine for several days together, was as follows:—

	£	s.	d.
1 engineer, board, beer, and lodging	0	2	3
1 feeder " "	0	2	3
2 men on stack, wages 2s., beer 3d., at 2s. 3d.	0	4	6
2 men untying or forking loose corn, at 2s. 3d.	0	4	6
1 man removing thrashed corn	0	2	3
5 men stacking straw, at 2s. 3d.	0	11	3
3 boys (1 carrying water for engine, 1 for chaff, 1 for cavings), wages 9d., beer 3d.	0	3	0
15	£1	10	0

Where elevators are used for the straw, three men may be dispensed with. A further saving of three hands—one on the stack, another untying, and a lad employed with chaff and cavings

—might possibly be effected; but practically, if the work is to be finished in proper style, as many as fifteen hands are required, and it is quite as usual to find that more, rather than fewer, are employed.

Cost of Hired Machine per Day and per Quarter.

	£	s.	d.
Hire of machine for 20 quarters, at 1s....	1	0	0
15 men and boys, at an average of 2s. per day, including beer	1	10	0
Coal and carriage	0	10	0
	£3	0	0

This is just 3s. per quarter, leaving out of account the cost of horses and men in bringing the machine an average distance of four miles, for four days' work or so at a time. The usual calculation, indeed, is that a hired machine costs about £3 10s., when every expense is included. I shall, however, abide by £3 as nearest to my experience. The cost of thrashing 500 quarters of corn, at 3s. per quarter, amounts to £75. In addition to this cost, there was a great deal of extra horse and manual labour incurred by bringing in the straw and cavings to the yard throughout the winter. Thatching was necessary to preserve the straw from getting wet, and with every precaution, there was always much litter and waste in the stackyard which could not be estimated. To clear up the *debris* of the various thrashings, the services of a man with a horse and cart were always necessary for some days, which I have estimated at £5 a-year to the debit of thrashing out of doors. The comparative waste of thrashing in and out of doors cannot be exactly ascertained; but my opinion is that more corn is wasted and spoiled by out-door than in-door thrashing. If you are caught by rain when taking in to the barn, the stack can be more quickly covered up than when not only that but the machine and some space around it require protection. When a great number of hands are employed with a portable machine, there is also a temptation to keep on thrashing, although it be not quite fine, or if actually stopped, to resume work quickly again, when wet runs about the stack and has damped the thrashing-machine. He who hires a machine is never certain when he may get it to a day, or sometimes to a week. It may happen that the very day the machine is set down to work, it begins to rain: the machine and hands to work it have come, and if there is any chance of getting on at all, it is the ordinary course to begin. Any one who has a fixed machine may generally choose a promising day for taking in, so as to incur much less liability to interruption than when thrashing for days together with a hired machine.

The natural place for straw is the yard. When a fixture is used, the corn in the straw, together with all the chaff and cavings in one bulk, is brought to the barn in fewer loads than the straw alone, after being thrashed, would make: moreover, two loads of sheaves may be loaded in the same time as one load of loose straw. When the straw is got into the barn adjoining the yards, it is readily carried about by a fork, and that regularly as wanted. When carts are used for conveying the straw, it is very frequently thrown down too thick, and at too long intervals. With a fixed machine, the chaff and cavings are deposited in their proper places, without either a waste of material or labour at all equivalent to that incurred by thrashing in the open air. The fodder for cattle is much more safe from wet and more handy in the barn than out of doors. Even though cattle-men be very careful, still wet must penetrate the stack at times when a cut is made, and damage to the straw must ensue, in addition to waste of labour and a litter in the stackyard. I cannot find that a fixed engine and a fixed thrashing machine have any drawbacks comparable to those attendant on moveable machines. At first sight thrashing in the field appears to be a quick process, which saves the trouble of moving the unthrashed corn; but, before all is done, more labour has been incurred. I once thrashed out 20 acres of barley in the field, and left the straw, chaff, and cavings, according to the usual course, to be brought home at leisure. Having no waggons, a man with a horse and cart was employed nearly all the winter for days together, to clear up; but, after all, he only made, as it were, a small hole in a large mountain, which required for its removal a great many carts for several days. The odd man in winter went more times for about perhaps 2 cwt. of chaff at a load than would have been sufficient to have brought in the whole of the unthrashed corn.

The past two winters I have only required a man for a few days altogether to clear up the refuse thatch in the stackyard. When taken in and thrashing, I now require for a regular full day's thrashing six men and two boys—one man and boy at the stack, one stout lad emptying carts, one man untying sheaves, one feeder, one man in straw-barn, one engineer, and one boy shovelling corn away from dressing machine. The engineer or the man who attends to the straw can generally for a minute or two at intervals look to the corn-barn. As, however, two men and a boy would be required to cart in the straw to the yards, if thrashed out of doors, that number of hands may fairly be kept out of the account of cost of thrashing. The number of hands required when the corn is in, then, amounts to four men and one boy, unless, which rarely happens, more than one day's thrashing takes place at a time, when two men are required at the straw. When thrashing out of doors with a hired machine, I found by experience that, including interruptions, the corn thrashed did not average more than 20 quarters per day, but for thrashing in-doors an average of 25 quarters may very fairly be taken; because, firstly, you will be more secure from such interruptions; and secondly, because a broken day, instead of being a serious hindrance to the work of the farm, may often be an accomodation, and provide work under cover, for hands that would otherwise not find profitable employment:—

Estimate of Cost of Fixed Engine for thrashing per Day and per Quarter, allowing 25 quarters per day's thrashing on 20 days a year.

	£	s.	d.
Interest and depreciation on £200, at 10 per cent., divided among 20 days	1	0	0
Interest on outlay of £100 for buildings for engine and machine, at 7 per cent., £7, divided by 20 days	0	7	0
3 men, at 2s.; 1 man, at 2s. 6d.; 1 boy, 6d ...	0	9	0
6 cwt. coal, with carriage	0	7	0
Oil	0	0	6
	£2	3	6

Total cost, £2 3s. 6d., which, divided by 25, gives 1s. 9d. per quarter.

When thrashing more than a day at a time, the straw requires stacking, and of course more hands to attend to it: two hands untying may also be required in case of very short sheaves, or that loose corn may be properly shaken up. Seven hands are the fewest who can work the machine and take in and thrash at the same time. Four hands only are required to thrash when sufficient corn is in the barn for half a day's thrashing; two hands can take in in a day enough for half a day's thrashing; four hands are required to fill the barn for a whole day's thrashing when the machine is not going. With a fixture all this may be varied, according to circumstances. In wet days, or parts of days, a great deal of thrashing may be done when the labourers could be occupied about nothing else.

By the hired machine the cost per quarter was about 3s., by the fixed engine about 1s. 9d. per quarter, being a saving of £31 5s. on 500 quarters. In this account, be it remarked, the increased labour of cleaning up the stackyard, which is now saved, is not taken into account. An additional advantage is that the straw, chaff, and cavings are kept dry and convenient for use, and though no exact price can be put upon these, I certainly do attach a considerable value to them. My horses have no hay during some months of winter, and eat up chaff, &c., very readily when given fresh. It is certainly anything but economical either of labour or material to waste chaff, and then cut straw to supply its place. The great bulk of practical farmers admit that the chaff of any kind of corn is more nutritious than the straw. Chemical analysis testifies to the same: then why waste chaff as of no use, when ready to hand without cutting? and why waste cavings, which are the most palatable and nutritious of fodder?

The fact is, that where there is a fixed machine a few hands can frequently be spared without inconvenience from other labour for thrashing, and sometimes a wet day may be turned to account when nothing else could be done. Two hands with an odd horse may often be spared to take in the matter of 12 or 20 loads of sheaves in a day, which can afterwards be thrashed on any morning or afternoon. When a fixed machine is used, the time of many hands cannot be wasted, as is frequently the case when the locomotive is changed from stack to stack. I like to have long stacks made in short joints for the convenience of taking in one or two parts, as it may happen, in a day. About fifteen or twenty cart-loads in a round stack make it a convenient stint for short winter days. My machine thrashes far more than twenty-five quarters a day, when worked all day; but not wishing to over-estimate, I have taken this as an average quantity. In thrashing oats, half a day's work often suffices to nearly fill the barn with straw. The expense of raising the steam—about 1s.—is of no account compared with the importance of getting the thrashing done when hands are convenient and straw required. I only pay the engineer extra wages when he drives the engine: 6d. a day extra is all the allowance, which amounts to very little in the course of the year; but still it seems to be a sufficient inducement to keep the engine clean and in good order, and to remain half an hour or so after the other workmen leave. Many people pay an engineer higher wages per week throughout the year. This is doubtful policy, and is certainly not economical where only a few weeks' work are required in the year.

My buildings are well placed with reference to the yards and stacks. When once the straw is in the barn, it is easily moved to the various places where required. My engine and machine of 6-horse power cost less than £200 when everything was included. The thrashing-machine, including a shaft which runs from the engine-house into the corn-barn, cost under £40. The maker lived near, and was at no cost for travelling expenses or carriage of materials, &c. Attached to the thrashing machine is one blower, similar to those generally belonging to portable machines: then from the shaft which extends into the corn-barn another common winnowing machine is driven by a strap. This machine (which only requires one small bolt to fasten it to the floor) is fed by the corn running down a spout, after being separated by the first blower from the chaff. This arrangement is so simple that there is little chance of anything getting out of order, and generally the corn is very well cleared, but not sufficiently so to be ready for market. Oats for home use, or barley for grinding, require no subsequent dressing. The lower dressing machine, which is worked by the engine when thrashing, is detached in a moment for dressing by hand.

A circular tank, 9 ft. deep and 9 ft. in diameter, to receive the soft water from the roofs of the buildings to supply the engine, was dug and bricked round with common mortar for about £6. The tank holds 4,000 gallons, or would do so if full; but a waste-drain, laid nearly a foot below the surface, as is desirable, of course diminishes its capacity. When full, the tank contains enough water to keep the engine going from 12 to 15 days. Practically it has never been nearly empty, as a good fall of rain for 24 hours makes it run over. Soft water is far preferable to common spring water in many respects, and a supply is generally thus more cheaply obtained than by sinking a well. I have already estimated the cost of preparing common farm buildings for the reception of fixed thrashing machinery at £100; such was my own experience.

The following are the details of the additions and alterations, as made by the landlord:—

Details of Buildings for Engine and Thrashing-machine.

	£	s.	d.
Chimney 40 ft. high, about 7,000 bricks, and labour	20	0	0

KENNEDY'S IMPROVED PROPELLERS FOR SHIPS.

Fig. 1.

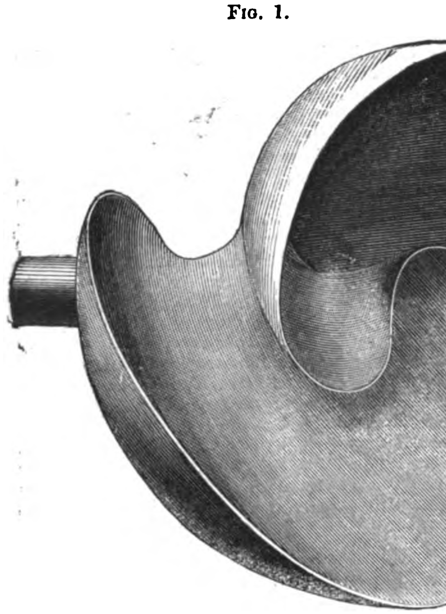
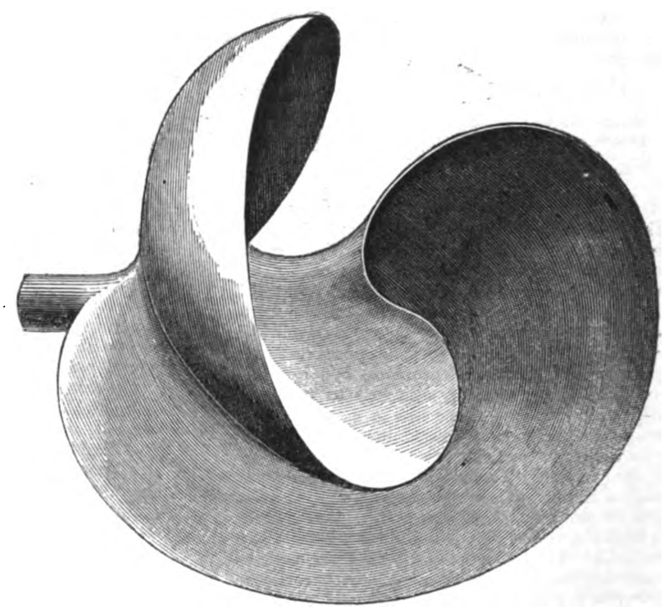


Fig. 2.



Engine-house, 13 ft. by 15, including fixing of boiler outside	30	0	0
Corn barn-floor, 21 by 11 ft. — 231 square ft. at 6d.	5	15	6
Loft where machine is placed, &c., 21 by 18 ft. —378 ft. at 9d..	14	3	6
Chaff-house floor, below, 21 by 7 ft. — 147 ft. at 6d.	3	13	6
Wooden partition between corn-barn and chaff, 21 by 8 ft. — 168 ft. at 6d.	4	4	0
Brick partition between corn-barn and unthrashed-corn department, 18 by 8 ft. — 144 ft., at 6d.	3	12	0
Building one brick thick, inside barn, on two sides, to receive the bearing of the battens for loft above, instead of beams, two sides, 21 by 8 ft. each — 336 square ft. at 6d.	8	8	0
Soft-water tank, 9 ft. diameter, 9 ft. deep; digging out and building with bricks and mortar, at 4s. per square yard (capacity of tank about 4,000 gallons)	6	0	0
Doors, window in corn-barn, drains, &c., about	5	0	0
	£100	16	6

I likewise had a granary built over the engine-house 13 by 15 ft., at a cost of about £24 for walls, floor, door, and window, exclusive of the roof, which would of course be required for engine-house, without such addition. This item I have not included in my estimate, because it is not necessarily connected with fixed thrashing-machinery. An engine-house, made as a lean-to, of one brick thick, would cost only about £20., roof included. A corn-barn, as above, 21 by 11 ft., would contain, when full, about 220 quarters of corn; but practically 50 or 60 quarters is all that can conveniently be held for dressing over and keeping the offal, &c., apart from the dressed and undressed corn.

In conclusion, I would repeat, that where a moveable engine could be employed in ploughing as well as in thrashing, there are great temptations to give it the preference; but otherwise the fixed engine is more desirable, since, whether my calculations are nearly correct or not, there can be no doubt that it is far more economical. At the same time when I ordered my fixed machinery, a friend, who had some outlying farm premises got a moveable engine, and found it not only more costly, but more troublesome to manage. Where such outbuildings exist too distant to be supplied with straw from the chief homestead, I think a fixed thrashing-machine would prove the most economical, even though moveable power should be hired to drive it. A fixed engine might at the same time do the chief part of the work at the home farm.

Having now endeavoured to discuss, as fairly as possible, the various points connected with this subject, I must leave others to draw their own conclusions whether a moveable or fixed engine will best suit their individual purpose.

Burcott Lodge, Leighton Buzzard.

KENNEDY'S IMPROVED PROPELLERS FOR SHIPS.

Mr. J. Kennedy, shipbuilder, of Whitehaven, Cumberland, who has lately paid considerable attention to the construction of ships, more particularly suitable for naval warfare, has invented and obtained letters patent for a screw or propeller which can be protected from an enemy's shot by means of an armour-plated shield, and from becoming fouled by wreck or other floating impediments. The invention consists in fixing, to a suitable axis, two or more blades of such a form as to enclose the water within their grasp when revolving. The shape of the blades somewhat resembles the form of the tail of a fish; the pitch can be altered by making the blades more or less deep or long.

Figures 1, 2, and 3, of the accompanying engravings are perspective views of three of these propellers, each view showing a propeller of different pitch. Figure 4 shows a propeller applied to the stern of a ship. The propeller shaft is there supported, and free to revolve in two bearings. The propellers for small vessels consist of blades, made of several pieces of iron, attached to an axis or shaft; but when of considerable size, are made of plates of metal, either steel or iron, rivetted upon ribs, with T, or angle iron, at the edges.

THE BED OF THE ATLANTIC OCEAN.

By Professor W. King.

The following "supplementary note" of Professor King, of Queen's College, Galway, is in continuation of that gentleman's report to the Atlantic Telegraph Company, published in this magazine on the 21st inst.:—

Mr. Hoskyn preserved specimens of Deep Sea Soundings in bottles containing spirits, by which means they have been prevented from drying, and have retained their original consistency. Orbulo-globigerinous mud thus preserved has quite the appearance of a thickish batter paste. To what depth below its surface the deposit continues in a pasty condition, has not yet been ascertained. The "bull-dog machine," so successfully used on board H.M.S. "Porcupine," brought up large quantities of it; we may therefore conclude that the deposit was penetrated to the depth of a few inches. Further, if we take into consideration the enormous vertical pressure of the ocean in deep places, it is difficult to conceive otherwise than that water would be forced to a considerable depth into the permeable mud, forming the two-mile deep "telegraph plateau." Under these conditions, we may fairly assume that at least its surface mass is highly charged with water, and consequently so soft and oozy that a body like a telegraph cable could not remain long on it without being covered up.

The mud, consisting as it does of living and dead foraminifera and their comminuted *debris*, is clearly an organic deposit. The rate at which it is formed will therefore depend on the rate of reproduction of these organisms, all other circumstances being favourable. Although little is known regarding the subject just mentioned, still we may form some idea of the rate at which foraminifera increase or multiply by a reference to facts supplied by other living objects. It is well known that many of the lower groups of animals are enormously reproductive. Numerous cases might be adduced, but it will be sufficient for my purpose simply to notice a group in which calcareous matter is an abundant constituent. Darwin, on the authority of Lieut. Willstead, R.N., cites the case of a ship stationed in the Persian Gulf, the bottom of which became encrusted with a layer of coral 2 ft. thick in 20 months. He likewise notices some experiments made by Dr. Allan on the coast of Madagascar, from which it was ascertained that portions of coral weighing 10 lb. increased 4 ft. in height and several feet in length during the short space of 6 or 7 months (*vide* Darwin's "Coral Reefs," p. 77 and 78). These cases may be accepted as good analogical proofs in favour of the belief that foraminifera, the lowest group of animals known, multiply to a surprising extent.

While investigating this subject, however, we must not overlook matter of some importance. Both corals and foraminifera shells are formed of lime derived from certain, if not all, of the calcareous solutions occurring in the ocean, the principal being sulphate of lime (4·617 per cent.) and chloride of calcium (3·657 per cent.), that is, proportional to other associated mineral ingredients. How these two compounds are in the first place derived, as appears to be the case, from another calcareous compound, viz., bi-carbonate of lime, common to the water, which rivers discharge into the ocean; or how they are afterwards decomposed by the vital agency of coral forming zoophytes and foraminifera, and next converted into the carbonate of lime of their skeletons or coverings, are subjects beyond my present purpose. The question for consideration is, are calcareous solutions as copiously supplied to the Atlantic, for its foraminifera, as they are to the tropical seas for the uses of coral-forming zoophytes? I see no reason to doubt the affirmative, as the per centages above given are deduced from analyses, made by Bybra, of

KENNEDY'S IMPROVED PROPELLERS FOR SHIPS.

FIG. 3.

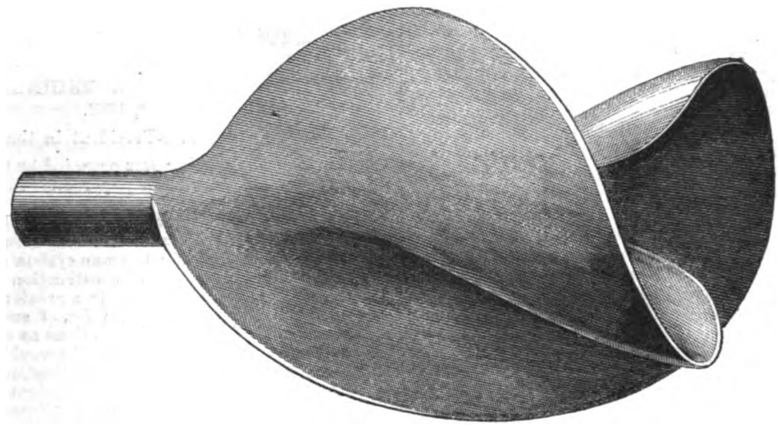
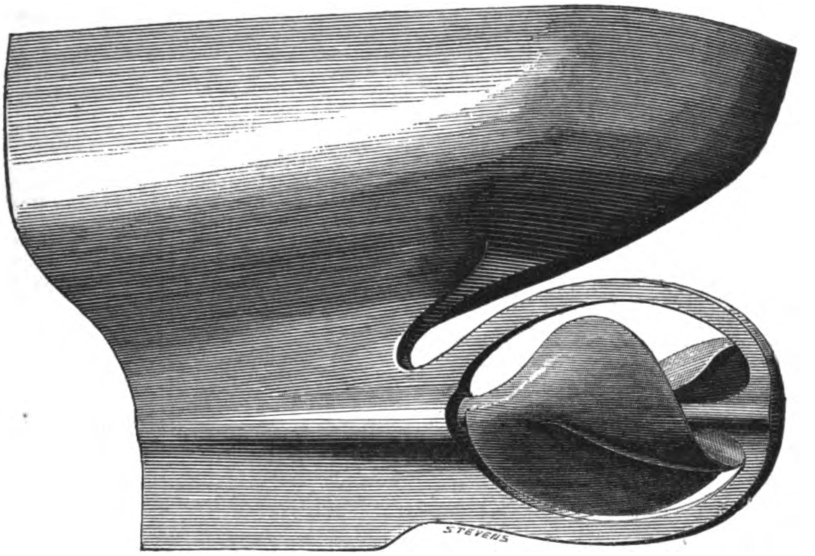


FIG. 4.



waters from the Pacific, Atlantic, and German Oceans.

It may also be observed that the balance of Nature requires us to believe that the foraminiferous life of the deep Atlantic is quite equal to the supply of calcareous matter. Thus, considering that rivers are every moment conveying enormous quantities of lime from the land into the sea, and that oceanic currents are widely diffusing it over the Atlantic, we may conclude that foraminiferous organisms, everywhere occurring on its deep sea bed, are appropriating this calcareous matter as rapidly as it is supplied. They evidently play the same important part in our seas as the coral forming zoophytes in warmer latitudes; and although the latter are labouring in shallower depths, and building up the more striking atolls and fringing reefs, the latter are nevertheless working quite as efficiently in the abysses of the Atlantic, and forming an enormously wide spread calcareous deposit. Ages on ages will be consumed before this deposit can attain the thickness of some of our limestone masses; but assuredly it will be materially increased during the short space of a human life.

In conclusion, reflecting on all the considerations which have been noticed, I feel my conviction strongly supported that a telegraph cable, if laid down on the orbulo-globigerinous bottom of the Atlantic, will, after the lapse of a few years, become sufficiently covered up to be protected from any ordinary dangers.

THE NEW ERICSSON BATTERY.

ON the 15th, the Ericsson battery, "Passaic," made her final trial trip, when her great guns were tried. The following is a report of the experiments:—

Firing commenced at half-past 1. The first shot struck about 300 yards from the vessel, in the water, glanced off, and flew into the bosom of the Palisades. Nothing broke—the turret was there, as strong and solid as a rock. The concussion was not felt any more than the captain of a 32-pounder feels it on board a frigate. The first fire resulted in no smoke to speak of, no inconvenient concussion, and the complete success of a grand idea. The first charge consisted of 20 lb. of powder, and a hollow shot (330 lb.), fired out of the 16-inch gun. It recoiled 17 inches. The second shot was fired out of the 15-inch gun, there being really no need of discharging the 11-inch. The first shot having proved the practicability of the principle, the entire charge of 35 lb. of powder was now put in. Notwithstanding the success of the experimental fire, the timid ones still kept in the background. Captain Drayton pulled the trigger. Once more the echoes of the Palisades rang out. The recoil and smoke were reported "insignificant," and the shot — a hollow one — buried itself again in the beach. Cheers were loudly given for the "Passaic." The noise is only troublesome outside the turret, on deck, where no one has any business to be. The recoil was a few inches greater than at first, owing to the compressers not being properly tightened. At the third shot the compressors were righted, and there was even less recoil than at first. A full 35 lb. charge was put in, and the 330 lb. hollow shot. The ball struck the water as before, there being no desire to elevate the gun, or to test any but the one great principle. The facts established by the experiment are as follows:—First, a gun may be fired inside a turret. Second, in order to appreciate the nature of the second result, it should be known that the Armstrong guns in England have been condemned for use on shipboard, chiefly because a sufficient number of men could not be placed in the turret to work them; 25 failed to do it satisfactorily, and the Armstrong gun weighs but 14 tons. On Saturday, four men worked a 15-inch gun, which weighs 20 tons. Next week Mr. Whitney will put a 15,000 lb. gun on board the "Koekuk," which will require 20 men, while the 42,600 lb. gun of the "Passaic" is moved by four. Third, the third result is a very important one. It is the immobility of the "Passaic." Waves break on the iron margin of the craft and splash in harmless foam about the deck. They have no hull to strike—no high bulwarks; even the turret presents an angle at every side. So much for the results. The following is a tabular recapitulation of the experiments:—

	Ball weighed.	Charge of Powder.	Recoil.
First shot ...	330 lb. (hollow)	20 lb.	17 in.
Second shot	330 lb. (hollow)	35 lb.	3 ft. 10 in.
Third shot...	330 lb.	35 lb.	2 ft. 8 in.

UNBRANNING OF WHEAT.

IN the report on the alleged grievances of the journeymen bakers, made by Mr. H. Seymour Tremenheere, to the Secretary of State for the Home Department, a process of unbranning wheat is described, which seems likely to exercise an important bearing on the supply of food. Messrs. Hadley, of the City Flour-mills, stated to Mr. Tremenheere as follows:—

"We have been making experiments for some time on the mode of unbranning wheat, invented by Mr. Bentz about the year 1846, in America, and subsequently patented. The object of this process is to separate the outer cuticle, which is wholly innutritious, from an interior section of the wheat-berry, which contains mostly nitrogenous matter, and which has hitherto been lost as human food.

"There are two leading advantages in this process. First, the cleanliness of the flour produced. In grinding by the ordinary process it is impossible to render the flour entirely free from dust and dirt. After putting the wheat through two or three processes of cleaning in the common way, there will still be some dirt remaining in it. All flour always contains more or less of this dust. There is also a portion of the beard of the wheat, a kind of fibrous appendage, which is always ground up with it; no process hitherto known has been able to get rid of it.

"By Mr. Benty's process, as the exterior cuticle is entirely removed previously to grinding, the flour is necessarily perfectly clean, and free both from dust and this fibrous down.

"Secondly, by the ordinary mode of grinding, the result obtained is 76 per cent. of flour for human use. By the new process we find, after a series of very careful experiments, extending over several months, that we obtain about 86 per cent. of the whole berry available to make bread.

"The money value of this increase of 10 per cent. is subject to a deduction of about one-half in consideration of the lessened quantity of offal, the value of which we may take at half of that of the flour if used as human food. The offal is used for many purposes, which give it a value larger than would at first sight be conjectured.

"In addition to this net increase of 5 per cent in value of flour available for human food, the flour made by this process, containing all the nitrogenous or nutritious matter existing in the

berry hitherto lost, yields a large increase in the number of loaves per sack. From the trials which we have ourselves made, we are satisfied that that increase may be safely stated at 20 lbs. of bread per sack of flour. This, taking the common average yield of a sack of flour at 90 four-pound loaves, or 360 lbs. of bread, amounts to an increase of upwards of 5 per cent. on the bread (18 lbs. would be exactly 5 per cent.)

"The aggregate gain in flour and bread may, therefore, safely be stated at 10 per cent.

"There is also another source of gain in a national point of view, in the increased nutritive value of the the whole mass of the flour made by this process"

Dr. Dauglish, whose paper descriptive of his process of making aërated bread was read before the Society of Arts, in reference to the unbranning, states as follows:—

"The invention was brought under the notice of the Erench Emperor, who caused some experiments to be made in one of the French bakeries, to test its value. The experiments were perfectly satisfactory, so far as the making of the extra quantity of fine flour was concerned; but when this flour was subjected to the ordinary process of fermentation, and made into bread, much to the astonishment of the parties conducting the experiments, and of the inventor himself, the bread was brown instead of white. The consequence, of course, has been, that the invention has never been brought into practical operation. But, about four years ago, a French chemist, M. Mége Mouriès directed his attention to the subject of utilising for the purpose of white bread, making the nutritious substances ordinarily thrown away with the bran, and the results of his enquiries were communicated in a memoir to the Academy of Sciences, on June 9, 1856, and have since been reported on by MM. Dumas, Pelouze, Payen, Peligot, and Chevreul.

"These results explain most satisfactorily the cause of failure of the flour prepared by the American method to make white bread.

"Before the publication of M. Mouriès' researches, the nutritious substance attached to the bran was considered by chemists to be a portion of the gluten of the grain, but it now proves not to be gluten at all, but chiefly a new nitrogenous body analogous to gluten, which the discoverer has named 'cerealine,' with a portion of another well-known nitrogenous body—'vegetable caseine.'

"Among the properties of this body, cerealine, M. Mouriès gives the following:—

"It is soluble in water, and insoluble in alcohol. It acts as a ferment on starch, dextrine, glucose, or grape sugar. It alters gluten extremely, and gives to the altered matter a brown colour. Its peculiar action, when brought into contract, in the process of fermentation, with the ordinary constituents of fine white flour, is the true cause of the dark-brown colour imparted to the bread made from flour in which the cerealine was retained.

"M. Mouriès, having satisfied himself as to the properties of cerealine, adopted a method by which its peculiar action was neutralized, and then made bread by the ordinary process of fermentation, in which the whole of the bran contained in the internal coat of the grain was allowed to remain. The result was a loaf having merely an orange colour, but none of that dark-brown colour which always results when the bran contained in the internal coat of the grain is used in bread made by the ordinary method.

"In like manner, by my process, in which the fermentative changes are never allowed to take place, bread made from wheaten meal, from which only the coarse bran has been separated, is so free from the dark-brown colour that it is difficult to persuade people that it is made from wheaten meal at all."—*Chemical News.*

THE total production of pig-iron in the United Kingdom, last year, is estimated at 3,712,390 tons, the county of Durham supplying 312,030 tons.

STONE IMPLEMENTS.

AT the fourth meeting of the present session of the Liverpool Literary and Philosophical Society, on the 15th ult., Dr. HUME read a paper on "The Manufacture and Use of Stone Implements."

The author commenced by noticing the arrangement of antiquities made by Mr. Thompson, of Copenhagen, into those of the bone, stone, bronze, and iron periods; by which degrees of civilization might be studied geographically over the world, as well as historically in the modern seats of civilized nations. His objects for exhibition and illustration comprised a triturating stone, with roller and rubber,—the former from Ireland, the latter from Fermando Po; querns; numerous examples of the stone malleus; hand war clubs from New Zealand; celts, wedges, &c., from Denmark, Ireland, Fiji, England, and New Zealand; flints from the drift on the banks of the Somme; flint arrows, combs, fish-hooks, &c., from Danby Moor, Yorkshire; and numerous flint flakes, sling-stones, &c., in general from the east coast of Yorkshire. Some of the objects had been sent for the occasion by Mr. Mayer; the Royal Institution; Mr. H. Duckworth, and Mr. H. Ecroyd Smith. The triturating stone still used in New Mexico, and occasionally by the Caffres at the Cape is a first approach to grinding. It is not very different from the two stones between which the Australian natives pounded the seeds in the expedition of Burke and Wills. In the countries which have progressed, this was succeeded by the pestle and mortar, and then by the quern, the wind-mill, the water-mill, &c. The quern was usually turned by two persons, as it is still in the Scottish Highlands, and the labour was regarded as very servile, hence slaves and captives were frequently employed in performing the task. Though modern millers have laboured to destroy the stones, they are still found; in the eastern side of Asia, and the west of Europe, and in the countries of primitive habits, they are still in actual use. Numerous quotations were given from our old English literature illustrative of their use in former times. The malleus, or hammer, was of various forms, often like the sledge-hammer of a smith, a wooden handle passing through its centre. In the eleventh century, the Anglo-Saxons used "bipennis" and "stan-ex" as convertible terms, so that they seemed to have used such stone mallet, or to have thought that the Roman bipennis was of that shape. Many of those are found in connection with the bones of large animals now quite extinct. Several elegant hand war clubs were exhibited, from New Zealand,—one of elegantly carved wood, and the other of stone. Those of black stone are identical, in form and size, with specimens found in England and Ireland; but a rare and curious one was shown of the favourite material, green stone. A piece of this had been hidden during the disturbances at Massacre Bay, and so valuable was it supposed to be that a space of ground four or five acres in extent was dug over to a depth of 4 ft. for the purpose of finding it. Ancient green stone axes have also been found in our own country, as well as in France. An object of this kind is sometimes called a "sacrificing axe," and the making of it occupies a man, at intervals, about two years. He rubs it with a small flint stone, of the size of a walnut or a small egg. The chisels, or wedges, are still more varied in their forms, their uses, and the places in which they are found. Several of them were shown mounted, for the purpose of war or the chase; some were shown blocked out, others partially ground, and some with defects taken out of them by grinding. In a few instances objects in metal had been imitated in form by subsequent ones in stone. No objects were shown mounted in stags' horn; but it was shown that these are of frequent occurrence in the crannogues of Ireland, the lacustrine habitations of Switzerland, and in some of the cuttings in France. In drawing attention to the flint arrow-heads and chippings, Dr. Hume noticed the valuable researches of M. de Seithes, of Abbeville, who had added a new and important chapter to science. He had shown that instead of archæology "piecing on" to geology, the two interlace or overlap; the human or archæological period having preceded severally the changes of a geological kind.

Proceedings of Societies.

INSTITUTION OF CIVIL ENGINEERS,

November 18, 1862.

JOHN FOWLER, Esq., Vice-President in the Chair.

THE whole of the evening was occupied by the discussion upon Mr. Crawford's paper on "The Railway System of Germany."

It was observed that the paper contained an interesting description of various railway structures, rather than treated of the German system of railways. The German system of construction was, in general, no more than adopting, in a greater or less degree, the plans which had been found successful in this country, with such modifications as the circumstances required; but their works would not as a rule bear comparison with those in England. For instance, the viaducts built from the designs of Mr. J. Miller, M. Inst. C.E., upon the Glasgow and Dumfries Railway, were still unequalled in Europe for boldness of conception and excellence of workmanship, and in Lancashire there were viaducts 100 ft. in height, and in other places 150 ft. in height, and in all these cases, instead of consisting of tier upon tier of arches, as was the practice on the Continent, there was only one tier of arches. With regard to the Dirschau and the Marienberg bridges, their mathematical construction had been admitted to be faulty, there being a want of due proportion between the several parts, and their cost had certainly not been less than £45 per ton.

One of the most remarkable examples of engineering on the Continent had not been noticed. This was the line from Cologne to the Prussian frontier, between Verviers and Liège. It was constructed at an early period in the history of railways, abounded in rapid curves, and comprised an extraordinary series of tunnels and viaducts.

When Mr. Vignoles, thirty years ago, laid out the railway from Brunswick to the foot of the Hartz Mountains, he introduced what was termed in this country the "contractor's rail," but what was better known in America and all over the Continent as the "Vignoles' rail." At the same time he strongly advocated the plan of fishing the joints, first adopted in Germany.

The great principles which characterized the German system of railways were, the simplification of the permanent way, and the perfection of their statistics. All the companies were compelled, as in France, to give positive returns, under specific heads, of every detail of expenditure, and as these were published annually, the companies were brought into a wholesome competition, for the reduction of the working expenses to a minimum. A recent inquiry showed, that the expenses per train mile on two-thirds of all the German railways were within a fraction of each other. Although it would be advantageous to follow the same plan in this country, as by tracing every item of expenditure to its source, it would readily be seen where economy could be effected, yet it was believed that the average expenses per train mile were less in Great Britain than in Germany, or indeed on the Continent generally. Late returns showed that on the Semmering Railway the working expenses exceeded the receipts—so that however advantageous that railway was to the Austrian Government, it was unprofitable as a speculation. The absence of preliminary and parliamentary expenses, and the possibility of obtaining land at its mere agricultural or town value, instead of paying an exorbitant price for it, led to economy in first cost. But on the other hand, in no part of the world could work be done so cheaply as in England, whether measurement or weight of material were taken as the standard of comparison.

It was believed that, owing to the small cost, comparatively, per mile, due to the causes which had been mentioned, and to the absence of competition, arising possibly from the fact, that Government had contributed aid, either directly or indirectly, to two-thirds of the entire system, German railways were destined to pay a remunerative interest to their shareholders. Until quite lately, Parliamentary Committees in this country appeared to consider that unlimited competition was beneficial; but experience had now proved that it was not desirable for the public, and certainly not for the shareholders. It was admitted that statistical returns were invaluable to railway companies, as enabling the directors and officers to trace

the cost of each individual part of their system, it might be through a series of years, and thus at once detect any excess of expenditure. But the utility of the publication of such returns was very questionable, as it was impossible fairly to contrast the details of the cost of one system with those of another, without being fully acquainted with all the circumstances affecting the cost in each case. For instance, on some portions of the North Eastern Railway, the expenditure per mile amounted to nearly 80 per cent. of the receipts, whereas on others it did not exceed a minimum of 40 per cent. Within any particular system, where all the facts were known, such comparisons could be properly made, but as between two different companies, where the conditions were dissimilar, they would be worse than useless, as being calculated to mislead those who placed reliance on them. It was mentioned, that comparative statements, prepared with great ability from exactly the same data, of the working expenses of the two companies resulted in deductions being drawn exactly the reverse of the facts. The rules of "The Association of Government Railway Directions," as to gradients and curves, were commented upon, as practically amounting to nothing; and the condemnation of the use of cast iron for bridges seemed to be without sufficient reason, as there were many admirable examples of the use of that material for railway bridges.

It was remarked, that some years ago a curve of seven chains radius had been laid down on a line in this country, and the trains were calculated to and did run round it at the rate of 25 miles an hour; and if circumstances required it, there was no reason why curves of 300 ft. radius should not be adopted. With regard to gradients, particular districts seemed fitted for certain inclinations: thus, for instance, in the West of England 1 in 70 or 1 in 80, and in other places 1 in 100, only could be obtained, except at a greatly increased outlay. The speed on German railways appeared to be lower than was necessary. On the Semmering Railway the express trains were limited to 14 miles an hour, both in ascending and descending gradients of 1 in 40. It was asserted that this speed might be doubled with safety, and that the cost of working up the Lickey incline at 28 miles an hour was not greater than at 15 miles an hour. From 1840 to 1845, the speed on that incline was 15 miles an hour, with passenger trains of seven or eight carriages, ; whilst from 1845 to 1855, owing to an increase of traffic, the trains were composed of from ten to twelve carriages, and they were conveyed up the incline, at from 28 to 30 miles an hour, at no greater practical cost.

It was observed that, so far back as the year 1848, the German governments had taken to the belief, that a special education for engineers of all classes —mechanical and civil—was one of the first duties of a government. At that time there were regular colleges for the training of skilled workmen and for the education of civil engineers, in most of the great cities of Germany. By these means a set of thoroughly educated young men was prepared, ready to acquire practical knowledge, and to turn it to account in a very short period of time. One result of this system had been, that whereas English locomotive engines were at first copied implicitly, the German engineers gradually took to making the designs for themselves, and to depart more and more from the established patterns, so that now, on most of the principal lines, the engines were made exclusively in Germany, in some cases at a less cost than in this country, and it was said that a Berlin firm had recently tendered successfully for locomotive engines required in England.

In regard to management and economy of working, it was maintained that the public convenience was less consulted on German rialways than on English lines; there were fewer trains, the speed was very much slower, and the stations further apart. The rate of fares in Germany had not been stated, but it was believed that for the transport of goods and minerals the charges were higher. These were elements why larger dividends were realized, on comparatively smaller capitals.

To this it was replied that in Westphalia, the centre of German industry, as many trains ran as on some English lines, and the speed of the express trains was 40 miles an hour.

With respect to the construction of German railways, it was believed that the earliest lines in Germany were offshoots from the Schools of Mines in that country; and though they had no doubt taken the first ideas of railways from their great projector, George Stephenson, yet they had been carried out by themselves; and that the earliest example of an iron lattice bridge was that across the Elbe at Magdeburgh, the wooden lattice having been previously adopted in America.

The growing prominence of Germany in the industrial arts was attributed mainly to the system of technical education, particularly of engineers, which prevailed there; and it was argued that the distance between the English and German engineers was an increasing one in favour of the latter, as was deemed to be evidenced by the superior character of the continental machinery in the International Exhibition.

One of the reasons why German railways had been executed so cheaply was attributed to the population supplying an excellent industrious class, and to the works not being pushed forward so hurriedly, by which the price of labour was artificially raised. Throughout Prussia the cost of the earthworks did not exceed from eightpence to ninepence per cubic yard—the German navvy receiving only one shilling and sixpence per day. Very little plant was employed, the barrow runs were longer, and the embankments were chiefly executed in that way, instead of by tipping from waggons from a great height, which might account for their assumed superiority.

In conclusion it was submitted, that without venturing to depreciate that which was a valuable adjunct to practical men of all classes, yet undue importance must not be attached to mere technical education, in contradistinction to that practical knowledge which it was essential the engineer should bring to bear in the exercise of his profession. The history of engineering showed that the works which reflected the highest honour on this country had been carried out by men who had not received a special education, but who, being possessed of great natural genius, were enabled to take advantage of the national resourses and peculiarities in such a way as to bring the profession to the high pitch it had already attained, and to command for English engineers universal respect.

November 25, 1862.

JOHN R. M'CLEAN, Esq., Vice-President, in the Chair.

THE first paper read was on "The Hownes Gill Viaduct, on the Stockton and Darlington Railway," by Mr. W. Cudworth, M. Inst. C.E.

This viaduct was situated near to the Consett Ironworks of the Derwent Iron Company, in the north-western part of the county of Durham, on what was formerly the Stanhope and Tyne Railway, an undertaking which came into the hands of the Stockton and Darlington Railway Company, in the year 1844. Hownes Gill was a dry ravine 800 ft. in width and 160 ft. in depth, and originally the line was laid out with gradients corresponding with the natural *contour* of the ground, that on the west side being 1 in 2½, and that on the east side 1 in 3. The traffic was conveyed over these gradients for some years with little difficulty, but a large accession of trade, due mainly to the discovery of the Cleveland ironstone, rendered greater facilities of transit imperative. It then became apparent, that the erection of a high level viaduct was indispensable; and as early as the year 1844, the directors of the Stockton and Darlington Railway Company took steps with the view of ascertaining the probable cost of such a structure. It was not, however, until December, 1856, that a contract was entered into with Mr. John Anderson, to erect a viaduct of firebrick set in hydraulic mortar, and the arches in cement, in eighteen months, and to uphold it for twelve months after completion, for the sum of £14,614. The design was prepared by Mr. T. Bouch (M. Inst. C.E), and was subsequently approved, with some modifications, by the late Mr. R. Stephenson and Mr. G. P. Bidder.

The extreme length of the viaduct was 730 ft., and its greatest height from the bottom of the inverts to the level of the rails 162 ft. It had twelve semicircular brick arches, each 50 ft. span, 14 in length, and 2 ft. 6 in. in thickness. The inverted arches in the foundations, four in number, which were introduced at the suggestion of Mr. Stephenson, so as to extend the bases of the three central piers until the weight scarcely exceeded 1 ton per superficial foot, had a versed sine of 14 ft., were 38 ft. in length, and 3 ft. in thickness. The extreme height of the five loftiest piers, measured from the springing of the inverts to the springing of the arches, ranged from 114 to 110 ft.: that of the six remaining piers diminished rapidly towards each end. Their length was 14 ft. at the top, and 38 ft. at the bottom, the latter dimension corresponding with that of the inverts. The piers, to within 15 ft. of the inverts, were stayed by buttresses transversely to the line of the viaduct. At this point they were only 17 ft. 6 in. in length, but below this level the buttresses merged into the piers, when they together had a rectangular section 38 ft. in length. The buttresses were 3 ft. thick at the top, and 5 ft. thick at the bottom; their projection from the piers being increased by offsets at intervals of 35 feet. The piers, although light in their proportions, were reduced by recesses, 7 ft. 3 in. wide, and averaging 3 ft. 9 in. deep, sunk in each side, so that the horizontal section of each pier with the buttresses was in the form of a double cross, the brickwork in the middle being only 2 ft. thick. These recesses were not continuous, but were divided into three compartments in height, and by their adoption the amount of brickwork in each pier was reduced about 14½ per cent. Between the spandril walls, two internal parallel walls of stone were introduced to sustain a platform of flagging, on which the way beams and the ballast were carried. The way beams, which were of Memel timber, were at first secured to the internal walls by bolts; but as this plan was found to be objectionable, the nuts from the holding down bolts were removed, and a thickness of 6 inches of coke ballast was interposed between the way beams and the flagging. The parapet consisted of a substantial cast iron railing. The firebricks, which were of excellent quality, weighed 9 lbs. 11 ozs. each, and cost the contractor at the viaduct £1 11s. 2d. per thousand. The number used was 2,655,000. It was a gratifying fact that the work was completed without accident, and that not a single crack was to be found in the whole of the structure. The erection of the scaffolding, which was of a very light character, was considerably facilitated by the hoisting tackle being made to traverse a stout wire rope stretched across the Gill, and firmly fixed at each side. When the arches were about to be turned, the piers were stayed by two parallel wire ropes stretched from end to end of the viaduct. The first brick was laid in February, 1857, and the first train passed over the viaduct in July, 1858. The cost of the structure amounted to £15,756, the contract sum having been increased by the additional depth of the foundations, by the adoption of a heavier parapet, and by other contingencies. Regarding the viaduct as an unpierced solid, its contents would amount to 61,910 cubic yards, and its cost would be 5s. 1d. per cubic yard.

The question of the relative cost of brick and iron viaducts was then alluded to, reference being made to two works of the latter description erected by Mr. Bouch on the South Durham and Lancashire Railway. These viaducts consisted of three lines of trellis girders resting upon skeleton piers, formed of six cast iron columns, jointed at intervals of 15 ft., and braced together by horizontal cast iron struts, and by vertical and horizontal tie bars of wrought iron. The clear spans between the piers were in all cases 48 ft. The Beelah viaduct was 1,000 ft. in length and 197 ft. in extreme height. The Deepdale viaduct more nearly resembled the Hownes Gill in its proportions, being 740 in length and 160 feet in extreme height. A comparison was therefore instituted between the probable cost of such an iron viaduct erected across the Hownes Gill Valley, and one of brickwork, supposing both to be built to carry a double line of railway, and that the spread of the foundations was in each case adjusted to sustain a weight of 2¼ tons per superficial foot, including the greatest moving load. The prices of the brickwork and of the masonry were taken from Mr. Anderson's schedule; those of the timber and ironwork were the prices actually paid to Messrs. Gilkes, Wilson, and Co., the contractors for the South Durham and Lancashire viaducts, minus a deduction of ten shillings per ton for the cost of cartage over country roads. With this adjustment it was found, that the cost of the viaducts, calculated in this way, would be £20,681 for the brick structure, and £16,259 for that of iron. It was thought probable, that the interest on the difference between these two amounts, say £222 per annum, would be absorbed in the periodical examination and painting of the iron, and the depreciation of the perishable timber platform; and that at the place referred to, a brick viaduct would be, ultimately at least, as cheap as one of iron. If the viaducts were designed to carry a single line of railway, the comparison would, it was believed, be still more in favour of brick. Although the author preferred brick to stone, he by no means regarded iron as ineligible under all circumstances. In situations which did not yield suitable building materials, and where there were no cheap means of conveyance from a distance, the small relative mass of an iron viaduct would be a strong argument in its favour;

for the whole weight of such a structure, including masonry foundations, would be less than one-fifth that of brick. This circumstance would also conduce to the selection of iron in cases of doubtful foundations.

The second paper was "On the Use of the Timber of the Palmyra Palm, in the Construction of Bridges," by Mr. Henry Byrne, M. Inst. C.E,

It was stated that, in the tract of country at the northern extremity of Ceylon, known as the Jaffna Peninsula, a district embracing an area of about 400 square miles, of which the author had charge till recently, as resident or assistant civil engineer, the only timber fit for building purposes was that of the Palmyra palm. This palm grew perfectly straight to a height of 60 ft., and was of nearly uniform thickness, 10 in., from a few feet above the ground. The lower half only, however, contained sufficient woody fibre to render it useful, and in good specimens this portion of the tree, at a height of 30 ft., was from 3 to 4 inches thick, or one-third the diameter of the stem, while at the base there was little or no pith. The specific gravity of the best portion of the stem was, on an average, 1·055, and its power of resistance to a transverse strain as compared with teak as 9 to 8. A well-grown tree would yield a pile 30 feet in length, requiring only to be stripped of its outer integument (sometimes, but erroneously, called the bark) and pointed to fit it for use. The author had never had occasion to use rings to prevent it from splitting in the process of driving, while the nature of the ground was such as to render shoes unnecessary. For roadway bearers, the most efficient plan was to split the tree in half, and after removing the pith, to join the two pieces together by wooden keys. at intervals of 4 ft., and to set the beams on edge, when they would be 8 in. deep, and 6 or 7 in. thick. Five lines of such bearers, under a roadway 15 ft. wide, and supported at intervals of 10 ft., were sufficient for the heaviest turnpike road traffic, including the largest elephant waggons. In every case the roadway bearers were supported directly by piling, the plan of strutting them from the piles, or of supporting them by iron tension rods, in order to allow of wider bays, being objectionable. The first method would involve either the weakening of the piles, by notching them to receive the struts, or the use of iron bolts and straps which corroded very rapidly in that climate, and injured the timber in contact with them. By the second plan the safety of the structure would depend solely upon the iron, and would be a source of constant anxiety from the perishable nature of that material. Iron had only been used for spiking the planking to the roadway bearers, when it was protected from damp, by the concrete usually laid over the planking. As to the durability of such bridges, the first the author constructed had stood for sixteen years, without requiring any material repairs. He believed that in the most unfavourable situations the average duration of a Palmyra timber bridge might be reckoned at twenty-five years; and even then a large proportion of the material might be used in the reconstruction of it. This timber seemed to be a proof against the attacks of the teredo, and inferior specimens remained perfectly sound below the water-line, while above it a coating of tar was all that was needed to prevent splitting from exposure to the sun. Details were then given of the actual cost of twenty lineal feet of a bridge constructed wholly with Palmyra timber, 300 ft. in length, and 15 ft. wide, from which it appeared that the cost per lineal foot amounted to 16s. 6d., and it was stated that some bridges had cost from 16 to 20 per cent. less. In the district referred to, an aggregate length of about 2,000 ft. of such bridges had been built, within the last few years, across the numerous tidal inlets which intersected it in various directions.

Effects of Iron Plating.—A communication from Toulon, in the *Messager du Midi*, says:—"The laying up of the frigate, "La Gloire," in the Castigneau dock has disclosed three unexpected phenomena; first, that the contact of the copper lining and the submerged iron plates had established a galvanic current, which produced the effect of a voltaic pile, and was completely deteriorating the armour of the frigate in the parts below the water line; secondly, that a species of shell fish, hitherto unknown, was afterwards discovered among the millions of mollusce by which the hull was covered, apparently produced under the influence of the same galvanic current; and, lastly, in the hold of the vessel 22,000 litres of wine were found to be transformed into vinegar, it is not known by what influence."

TO CORRESPONDENTS.

Received.—W.S.U., P.J.W., W.N.N., G.H.B., J.H.T., G.H.B., Mr. Iron, G.W., E.K. & F.T., J.F.C., W.M. J.H.S., W.J.

A correspondent wishes for the address of X.Y.Z., whose letter on "propulsion of vessels" appeared in Oct. 31st last.

Correspondence.

[*We do not hold ourselves responsible for the opinions of our Correspondents.*]

ARMOUR PLATES AND WOOD BACKING.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Sir,—The necessity of being brief in one's communications often puts a correspondent in the position of not writing so intelligibly as he might, and of trusting to his opponent in a discussion, to interpret fully and correctly an argument against himself, which it is vain to imagine controversialists will do. It would be expecting more, therefore, from "Civilian" than I ought, if I were surprised that he has misapprehended one of my points in favour of wood backing to armour plates; but it will be proper that I should state it now explicitly. I allude to the clear gain of a large portion of the resistance against shot which wood backing affords, because of its not throwing, I asserted, any burden in respect thereof upon the buoyancy of the vessel. I referred to the 4 and 5 ft. in depth, of the backing that is under water. Indian teak is rather a light wood, though strong for resistance; its specific gravity, when dry, is under 0.7, and, when wet, may probably be 0·75 or 0·8; consequently its displacement of water, when wholly immerged, will support its own weight and a fourth or a fifth more; so that, taking also into account the port-holes, more than a third of the wood defence must be water-borne, and the same proportion of the resistance will be freely acquired. Not so with the iron defence, which exists, as a cruel burden, upon the buoyancy of the ship.

All this is so undeniable, that no observations purporting to be a reply to it, would have been made, except on the hypothesis of misapprehension, occasioned by my brevity; and so the remarks upon it by "Civilian" are very true, only they do not touch the subject. "I must surely know," he says, "that weight for weight, and strength for strength, much greater displacement can be, and is, attained in naval architecture with iron plates than with timber." Equal weights will give equal displacements; greater tonnage, or greater displacement, consequent on greater tonnage and unequal weights, is what he means. But the question is not about the weight of the hull of a ship in relation to its strength and capacity; but about its weight in relation to penetrative resistance to shot. Nor is the question about buoyancy in relation to tonnage; but about buoyancy in relation to floating existence under fire, and, indeed, out of it too. Thus, if the iron defence is carried beyond a certain extent, the vessel sinks; but we may go on increasing the thickness of the wooden sides until they meet, and still a balance of buoyancy will remain. We get the unsinkable ship. Even so the matter stands when the breadth of beam is a given dimension, or, as though we were obliged to put both wood and iron defences within the skin of the ship; but that is not the case of the "Warrior," nor was it the case under discussion. When the defences are placed outside, it is obvious at a glance, that for all which is under water, wood is a relief, and iron is a burden to a ship.

I am sorry that "Civilian" and myself are still at issue on the question, whether wood backing presents a difficulty or a facility for the penetration of iron plates by shot and punches. It is, however, in the affirmative that I reciprocate his remark about his having "no hope of converting" me; for I *do* hope to convince him that he has made a mistake here, because his writings display that he is a gentleman of excellent good sense, who happened hastily to form an opinion of the evil of the elasticity of wood backing from the results of experiments, of which the apparent bearings only he adopted, and without giving them adequate reasoning consideration. But I wish to say that the evil to which I allude is the special one of facilitating, as it is alleged, the piercing of the armour plates, for I quite agree with him that the elasticity of the wood is truly an obstacle in the way of securely fixing them, and if it cannot be done, it will be as he says, "far better to have them riddled with shot holes which might be plugged, than 40 or 50 ft. of surface left totally unprotected" by any one of them being displaced. This could be done with heavy shot from great distances, because smashing and not perforation would be their work; and then shells of the ordinary kind could be poured in from the same distances with the ordinary guns. This is the great danger the "Warrior" will run, and may induce her to fight end on till within a certain distance, for the traditions about a raking fire are over; they have had their day, and she is well prepared by her construction for tactics of this kind.

"Civilian" speaks of me as "a theorizing critic," and directs my attention to an experiment in which one plate was backed with blocks of oak, and the other with a block of cast iron. But experiments require criticising as well as principles; they can bear a right and a wrong interpretation; and "Civilian" has certainly been unfortunate in his theoretical deduction from the one referred to. The greater effect of shot upon the wooden-backed plate, which of course was to be expected, did *not* "settle the question of rigid *versus* elastic backing," but of their iron *versus* indefinitely thick iron, for their was a conjoint resistance in the cast iron block and the plate. Wood can afford no assistance to the iron, only an independent resistance of its own; and if it could, still the question of rigidity and elasticity would not be touched, for that must be settled with rigid and elastic bearings merely, without continuous surfaces. The latter however, may be allowed in the case of wood, without any essential change in the conditions of the problem.

"Civilian" has been so good as to say, that it must have been an inadvertency on my part to contend that a wood-backing is an obstruction to the plates being perforated; on the contrary, this opinion is founded on a long experience in mechanical pursuits. He himself describes exceedingly well the *modus operandi* of the obstruction. "The yielding of the backing causes the plate to be driven inwards bodily, over an area of some feet around the point struck, and to buckle outwards at its extremities." Exactly so; and thus the work done by the projectile force is in part distributed and dispersed by implicating a larger area in the resistance, instead of being concentrated on only the surfaces in collision, as would be the case much more nearly if the plates were held up very stiffly to the blow, either by an iron framing with open panels, or by their fixture, if small, by their edges. To procure rigidity by the addition of another plate as backing, is to do more than that, and the experiment is deceptive. It is to change the conditions of the problem, because we are reasoning about a *given* thickness, or else we are not reasoning at all. This is what I meant by insisting on the necessity of conditions, in order to put "the question logically and usefully at issue"—the conditions of a special problem, and not of the wider question —iron *versus* wood—to which "Civilian" makes them refer. There are conditions absolute, on which alone, apart from any mathematical difficulties, hangs the logical possibility of the solution of a problem, and without which there is no advance beyond truisms; and there are conditions arbitrary, referring to mathematical and other difficulties, on which the proportion of abstract to concrete truth will turn. It was a condition of the former kind I dwelt upon, and the violation of which I illustrated in "Civilian's" interpretation of the experiment, in not recognising a variation virtually in the thickness of the plates. The absolute condition of a given quantity was abandoned, and no notice taken.

Yours, &c.,
Ben Cheverton.

[Though the question of "wood-backing" is an important one, we think that it has been sufficiently "ventilated" in our columns for the time. We will, however, give "Civilian" an opportunity, if he likes, to answer Mr. Cheverton's last two letters, and there the controversy must end for the present. —Ed. *M. M.*]

IRON MASTS.

Sir,—Having seen in your last week's number of the Mechanics' Magazine, Capt. Cooper Cole's plan of Iron Hollow *Sheer Masts*, I am happy to have it in my power to state, that it is by far the strongest principle of masting vessels — much superior to masts having only rigging and stays for their support. I have rigged no less than seven boats on that principle, and, consequently, I have had sufficient proof of their superior strength, which I esteem one-third stronger. This is easily imagined in considering that the *lee* standing rigging of a ship is not only no support to the mast, but from its weight, together with the wind acting upon it, tends to drag the mast over.

A mast between the sheers might well be dispensed with, and its material given to strengthen the sheers.

It was formerly thought that sheer masts, joined at their apex, could not be made sufficiently strong, but as relates to *wooden sheer masts*, I fully proved the contrary, and no doubt iron hollow sheer masts would be made much stronger.

I am, &c.,
MOLYNEUX SHULDHAM,
Dec. 3rd, 1862. Commander R.N.

Meetings for the Week.

MON.—*Royal Geographical Soc.*, 1, "Narrative of a Journey from Tientsin to Mukden in Manchuria," by A. Mitchie, Esq. 2, Route from Pekin to St. Petersburg, *via* Mongolia, Siberia, and Moscow," by C. M. Grant, Esq., at 8.30 p.m.
London Inst., "On the Class Reptilia," by R. Owen, Esq., at 7 p.m.

TUES.—*Inst. Civil Engineers*, Discussion upon Mr. Makinson's paper, "On some of the Internal Disturbing Forces of Locomotive Engines," at 8. p.m.

WED.—*London Inst.*, "On the Operation of Heat, with reference to Volcanoes on Earthquakes," by E. W. Brayley, Esq., at 7 p.m.
Soc. of Arts, "On the Construction of Labourer's Cottages and Sanitary Building Appliances," (Major-General Tremenheere in the chair) at 8. p.m.

THURS.—*Soc. of Antiquaries*, The election of Fellows, at 8 p.m.

FRI.—*Architectural Assoc.*, "On Perspective, illustrated by Models," by E. L. Paraire.
London Inst., "On the Chemistry of the Non-Metallic Elements," by F. Field, Esq.

Gossip.

A prospectus has been issued of the United Kingdom Railway Rolling Stock Company, with a capital of £100,000, in shares of £10 The undertaking is for the purpose of purchasing railway rolling stock, and leasing it to railway companies and others for short periods under agreements which will provide for the purchase of the stock by the companies at the expiration of a lease, the rent and purchase money being payable by quarterly instalments extending over five or seven years.

According to the general acts of Parliament 3rd Geo. 4, c. 126, s. 32, "ploughs, harrows, and implements of husbandry" and horses, cattle, carriages, &c., when employed in carrying or conveying them, are exempt from tolls: 14 and 15 Vic., c. 38, s. 4, exempts steam-thrashing machines and 16 and 17 Vic.,c.135, s.6, exempts steam-engines when attached to thrashing machines, &c. A toll collector receiving tolls on these implements can, therefore, be summoned before a magistrate of the district, and compelled to refund the money.

A prospectus has been issued of the Oxygen Gas Company, with a capital of £100,000, in shares of £20. The company propose to purchase Mr. Webster's patent for the manufacture of oxygen gas (the consideration for which is to be £25,000 entirely in paid-up shares), and to grant licenses for its use. Hitherto the cost of producing oxygen gas has been £6 per 1,000 cubic feet, and the statement is that under the present process it can be produced in any quantity at from 5s. to 10s. per 1,000 feet. The chief use anticipated for it is to produce perfect combustion in lamps, stoves, smelting furnaces, &c.

One of the specifications we described three weeks, ago, No. 751, may be termed a sensation or monster specification. It consists of 36 pages, 104 (hundred and four!) drawings, and it costs £2 13s. It measures 6 in. thick. Let us hope that it contains as much mind as it undoubtedly does matter. The patentee is Mr. Thomas Dunn, of Pendleton, Manchester, the same gentleman, we believe, whose portrait is to be seen at the Kensington Museum.

GREAT TELEGRAPH FEAT.—The unparalled feat of writing by telegraph direct through a continuous line of 3,500 miles was recently achieved in the United States. Between 4 and 5 p.m., a news message was sent to San Francisco, to which, a few minutes afterwards, a return message was received, dated San Francisco, Nov. 6, 2½ p.m. The New York message of 5 p.m. was answered at 2 p.m., or three hours before it was sent, in the usual order of time. The difference in time between the two cities is three hours and fourteen minutes. This, we believe, is the longest circuit ever worked in the history of telegraphing.

ELECTRIC AND INTERNATIONAL TELEGRAPH.—A special meeting of this company was held yesterday at the offices, Telegraph-street; the Hon. R. Grimston in the chair. The Chairman said the meeting was for the purpose of enabling the directors to consolidate into stock the shares upon which all the calls had been paid, and to authorize the raising of additional capital. In 1857 the capital of the company amounted to £740,094, and the revenue receipts for that year to £122,231. Last year the capital amounted to £912,565, and the revenue receipts to £220,548, so that in a period of seven years, while the capital had increased at the rate of 23 per cent, the revenue receipts had increased at the rate of 79 per cent. Foreign Governments were putting up land wires, which would all bring business. The increase would come from the great development of traffic on the company's system; the 900 stations would act as feeders. The main lines were gradually being choked up with traffic. To meet this increase of business the company would be prepared in May next with new lines of communication to Scotland, the North, and the manufacturing districts. The directors intend to carry out these additions by the issue of 15,000 shares of £10 each. A deposit of £1 10s. on each share would entitle the owner to be registered as having paid up £3 on the £10 shares. He then moved a resolution authorizing the conversion of 7,199 shares into stock. The motion was seconded and agreed to. The sum of 100 guineas having been unanimously voted for the relief of the distressed operatives in Lancashire, a vote of thanks to the chairman closed the proceedings.

RAILWAYS AND GOVERNMENT CONTROL.—At the last monthly meeting of the Association for the Promotion of Social Science, a paper was read by Mr. P. H. Rathbone, in which he discussed the question—"How far Railways should be placed under Government control." Mr. Rathbone took a brief review of the railway system in this country, pointing to the enormous capital invested, for which no adequate return was, as regarded many of the lines, received. After showing that it was not good for the public, though they received a temporary benefit, that any undertaking should be carried on at a loss, he contended that the capital in railways might be expended to greater advantage than at present. It was rather matter of surprise that the present depreciation was not even greater than it is. The plan he suggested to remedy the defects of the present system was to have a railway department of the Government, for making new railways or the extension of old ones, and that the actual work should be paid for as in any other case. He had also gradually come round to the opinion that the French plan of leasing railways for a number of years, and that they should eventually revert to the Government, was a desirable one. A discussion followed, during which a suggestion was made that Government ought to have the supervision of railways, as a protection to the public against accidents which were constantly occurring. Thanks were voted to Mr. Rathbone for his paper.

A TELESCOPIC LADDER.—The *Hereford Times* says that a very ingenious and admirable invention, called the telescopic ladder, has just been patented by the inventor, Mr. G. H. Morgan, surveyor and builder, New Market-street, in that city. This ladder, which might be made to a great length, shuts up like a telescope, the uppermost *floor*, so to speak, shutting up in the next, and so on to the bottom; in like manner, the first floor is easily projected, and may be turned against a wall at any angle: then follows the second, third, fourth, &c. The whole series shuts up into a small compass.

DEATH AND TRADE.—The American Government advertises for 2,000 head boards for graves. They are to be of black walnut, clear of knots, four feet long, and ten inches wide. D.W. Kolbe, of Philadelphia advertises to furnish artificial limbs at 50 dollars for each limb amputator above knee joint; or 35 dollars if amputated below the knee joint.—*Scientific American.*

THE ILLUMINATING POWER OF THE GAS SUPPLIED TO THE CITY.—At a recent meeting of the City Sewers Commission in the Guildhall, Dr. Letheby presented his report on the illuminating power of the gas supplied to the city of London during the autumn quarter by the Great Central Gas, the Chartered, and Commercial Gas Companies. The gas had been tested in accordance with the instructions of the Metropolis Gas Act of 1860. It had been tested at two places, namely, at the London Hospital and at Finsbury-square, and 325 examinations had been made. The results were, that the mean illuminating power of the Great Central Gas was equal to 13·34 sperm candles of the standard quality, and that of the Chartered to 13·78 candles, and that of the Commercial to 13·02. The weekly average of the Great Central had ranged from 12·69 to 14·93, and that of the Commercial from 12·41 to 13·85. The difference on the mean illuminating power of the Great Central Gas at the two places where it has been tested, namely, at Finsbury-square and the London Hospital, which are nearly two miles apart, differed only to the extent of 0·45 of a candle, and as the largest average (13·55) was at Finsbury-square, it was manifest that the difference was accidental. These results indicate that the gas supplied in the city by the three companies has not, during any week, been below the standard quality, and that the quarterly averages have been from 8·5 to 0·15 per cent. above it. The former is the excess of the Commercial average, and the latter of the Chartered; that of the Great Central having been 13 per cent. over the standard. Last year at this time the quarterly average of the Great Central was only 12·16 sperm candles, and the mean illuminating power of that gas for the corresponding quarter of the last seven years has been 12·55 candles. The quality is therefore improving.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the Proprietors of this Magazine. Other Papers are hereby warned not to produce them without an acknowledgement:—

STEAM ENGINES, &c., 1337, 1340.
BOILERS AND FURNACES, 1326, 1380.
ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 1341, 1351, 1356, 1359, 1360, 1365, 1372, 1389.
SHIPS AND BOATS, including their fittings, 1329, 1336, 1346, 1362, 1370, 1374, 1381, 1397, 1405.
CULTIVATION OF THE SOIL, including agricultural implements and machines, 1355, 1369, 1379, 1391.
FOOD AND BEVERAGES, including apparatus for preparing food for men and animals, 1338, 1373, 1395, 1396.
FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 1345, 1348, 1368, 1375, 1376, 1392, 1403, 1406, 1408.
BUILDINGS AND BUILDING MATERIALS—*none.*
LIGHTING, HEATING, AND VENTILATING, 1332, 1334, 1336, 1382, 1399.
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 1327, 1328, 1330, 1314, 1353, 1361, 1377, 1383, 1386, 1387, 1388, 1390, 1394, 1400.
METALS, including apparatus for their manufacture, 1333, 1339, 1378, 1384, 1401.
CHEMISTRY AND PHOTOGRAPHY, 1352, 1385.
ELECTRICAL APPARATUS, 1398.
WARFARE, 1335, 1357, 1393, 1402, 1410.
LETTER-PRESS PRINTING, 1349, 1354.
MISCELLANEOUS, 1342, 1343, 1347, 1350, 1358, 1363, 1364, 1367, 1371, 1404, 1407, 1409.

1326. T. PARKINSON, J. NORMAN, and R. COTTAM. *Certain improvements in the construction of furnaces for steam boilers.* Dated May 5, 1862.

This invention consists in constructing the grate bars of the furnaces of steam boilers of steel or wrought iron tubes, connected at their ends to water chambers. A constant supply of water is introduced into these tubes and chambers, by suitable pipes, and the steam generated in them is carried off into the interior of the boiler by a pipe or pipes passing from the chamber near the bridge along the flue to the back end of the boiler, or in any other convenient manner. In order to secure the ends of the tubes into the water chambers in a cheap and efficient manner, the inventors run the metal of the chambers around the ends of the tubes. *Patent abandoned.*

1327. L. G. PERREAUX. *Certain improvements in clocks or machines for keeping time.* Dated May 5, 1862.

This invention consists:—1. In the employment of the weight of falling sand as a motive power instead of the weights and springs of ordinary clocks. 2. In the mechanism or apparatus for regulating the flow of sand, so as to give the necessary movements to the hands on an ordinary dial for indicating the time. Each apparatus is formed of three distinct parts. The first two form reservoirs, one for containing, and the other for receiving, alternately, the sand; the third is the space between them, which is adapted to receive the movement of the clock. The opening for the flow of the sand from the upper reservoir should be large enough to allow it to pass through, so as to act in an uniform manner on the hands. Three ratchet wheels are employed which have no connection with each other; they are worked by means of clicks or pawls, two of which belong to the hands, and the other to the striking part, and are moved by levers. These levers are provided at one end with a trough adapted to receive the sand, and at the other end with a counter weight. When the sand falls into the trough

its continuous flow destroys the equilibruim, and in falling imparts to the rod forming the fulcrum of the lever the necessary movement for pushing forward the clicks or pawls, and turns the wheels of the hands. The trough then empties into the reservoir beneath, and the counterweight causes it to return to its original position, to continue the same movement until all the sand has run through. *Patent completed.*

1328. H. ALLMAN. *Certain improvements in the construction of apparatus commonly called locks.* Dated May 5, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1329. T. WILSON. *Improvements in covering ships of war and land batteries with armour plates, and in the construction and steering ships of war.* Dated May 5, 1862.

In manufacturing armour plates for ships of war and batteries, according to this invention, the patentee makes the said plates either of wrought-iron or steel, or of copper, or of gun-metal, or other metal or metallic alloy which is possessed of great hardness and toughness. In making the said plates of iron or steel, he forms ribs or flanges on their surfaces, the said ribs or flanges serving to attach or secure the said plates to the ship or battery, as hereinafter explained. The ribs or flanges may either be made on the plates by rolling or forging during the manufacture of the plates, or the plates may be made without ribs or flanges, and the ribs or flanges made separately may afterwards be attached to the plates by welding or brazing; or the ribs or flanges may be made on the plates by taking flat plates and bending the edges, or portions of the edges of the plate, into planes at right angles to the plane of the plate. In making armour plates of gun-metal or other hard and tough metal or alloy, he either makes the said plates plain, or he makes them with ribs. In making ribbed armour plates of gun-metal, or other metal or alloy which requires to be fashioned by the process of casting, he forms the ribs or flanges on the plates by the casting process during the manufacture of the plates. When he makes armour plates of the alloy called Muntz's metal, that is to say, of an alloy composed of 40 parts by weight of zinc, and 60 parts by weight of copper, he either casts the said plates, and employs them without having been rolled, or he takes ingots of the said alloy, and heating the ingots to redness, he rolls them between rolls, either plain or having figures suitable to form plates, having ribs or flanges thereon. The improvements in fastening or securing armour plates to ships of war and batteries consist further as follows:—He fastens or secures the plates by means of bolts or fastenings made larger in diameter at their screwed ends than at their middle, the object being to transfer vibration to the middle or plain part of the bolt, and thereby to secure the screwed ends of the bolt from injury. The invention cannot be fully described without reference to the drawings. *Patent completed.*

1330. S. BARNETT. *Improvements in helmets for divers.* Dated May 5, 1862.

This invention consists, firstly, in constructing the discharge valve of the helmet so that the spindle of the valve projects through and slightly beyond the outside cover of the valve in which the spindle can move backwards and forwards. By pressure upon the projecting part or exterior end of the spindle, the diaphragm of the valve may be pressed inwards home to its seat, preventing the escape of air. A spiral spring around the spindle, and between the diaphragm of the valve and the outside cover, reopens the valve upon the pressure being removed. Secondly, the improved helmet is so constructed that the front eye is attached to the helmet by means of a hinged joint, the metal rim of the eye fitting into a seat of vulcanised india-rubber. The improvements further consist in constructing the metal screw collar, which unites at the neck the two parts of the diving helmet, with suitable holes, or orifices to receive a pin, so that the upper or detachable part, when screwed into its proper position upon the lower part, may be locked securely therein by means of the pin, which the inventor terms a locking-pin, the said pin being attached to the helmet by means of a chain. *Patent abandoned.*

1332. C. BINKS. *Improved methods of obtaining hydrogen gas and certain gaseous compounds of hydrogen and of carbon.* Dated May 5, 1862.

This consists in applying to the carbon or carbonaceous materials, whilst kept at ordinary temperatures, steam previously so strongly heated or superheated as to be decomposed on contact with the carbon, and, as contra distinguished from the usual method resorted to, for decomposing water through the agency of carbon, and applying to it steam of ordinary temperatures. Or, in other words, he makes the steam itself, and not the carbon, as commonly practised in such operations, the vehicle of the heat requisite to effect its decomposition, or the combination of its elements with the carbon on being brought in contact with it. *Patent abandoned.*

1333. F. MARREL. *Improvements in forming wrought-iron bars for the manufacture of armour-plates and other articles of forged iron.* Dated May 5, 1862.

This invention consists in rolling iron bars, with grooved flanges or projections of a peculiar shape, for insuring a strong joint between the bars when employed for forming a pile for the manufacture of armour plates and other articles of forged iron. *Patent completed.*

1334. J. VICTOR, J. POLGLASE, and W. ROUNSEVELL. *Improvements in the manufacture of safety fuses for mining and other purposes.* Dated May 5, 1862.

Here the tubes or external portions of the fuses are constructed entirely of metal. The patentees protect the lead or soft metal tubes by covering the same externally with strips of hard metal wound spirally around the tubes. They also make safety fuses of skelps or strips of hard metal, the metal used being zinc or other metal in a simple state, or alloy of metal or combined metals, such as plumbic zinc or other coated metals. *Patent completed.*

1335. R. BURLEY. *Improved arrangements for using ordnance under water, and in part applicable otherwise.* Dated May 5, 1862.

One important feature here consists in fitting ordnance in the lower part of a war vessel, so as to deliver its charge below water in a direction most suitable for damaging an enemy's vessel in a part rendered comparatively vulnerable by the absence of armour plates. *Patent completed.*

1336. R. BIRSHBY. *Improvements in lifting or lightening ships for entering shallow harbours, or docking and other purposes.* Dated May 5, 1862.

This consists in the employment of tanks or buoys, suitably arranged and adjusted for raising ships, whereby they are caused to draw less water, and their entry into shallow harbours or docks facilitated. *Patent abandoned.*

1337. J. ROSCOE. *An improved lubricator for steam engines* Dated May 5, 1862.

This consists in so constructing a lubricator as to enable tallow to be used as the lubricant, and, further, in adjusting thereto an air pipe or vessel for the purpose of forcing out the lubricating matter (as described), thereby rendering the lubricator especially adapted for locomotive engines when going down inclines. *Patent completed.*

1338. P. L. A. T. SOURBE. *Improvements in maturing spirits and wines.* Dated May 3, 1862.

Here, while the spirit or wine is contained in a porous vessel, by preference the wooden cask in which it is originally stored in the country where it is produced, the inventor heats and cools it alternately several times successively, the cask or vessel being securely closed during the whole operation, so that the heating process produces a considerable pressure within the cask or vessel, so much so that the liquid, to some extent, sweats through the pores of the wood or material of which the porous vessel is composed, and evaporates at the surface. When the heating process is discontinued, and the spirit or wine allowed to cool, a partial vacuum is produced within the cask or vessel, and to supply this air gradually enters through the pores of the cask or vessel. *Patent abandoned.*

1339. E. B. WILSON. *An improvement in machinery or apparatus used in the manufacture of malleable iron and steel.* Dated May 5, 1862.

This relates to the vessel in which the molten metal is treated during its conversion into malleable metal or steel, and consists in providing such vessel with a central, or nearly central, exit for the gases, such exit or escape passage dipping at its lower lip into the molten metal, and extending to within a short distance from the bottom of the vessel, at or near the centre thereof. A space is left round the gas exit passage between its exterior sides and the inner sides of the vessel, with the exception of a portion on one side, which is left to form a convenient outlet for emptying the vessel. Provision is also made for hanging the vessel on centres or pivots at each side thereof. The molten metal having been run into the vessel, air is blown therein at one or more separate points of, or entirely round, the top space, which air, after passing under the lip, permeates the molten metal and escapes with the gases up the outlet. *Patent completed.*

1340. H. JOHNSON. *Improvements in steam generators.* (A communication.) Dated May 5, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1341. J. A. *Improved apparatus for measuring and indicating distances travelled by wheel carriages.* Dated May 5, 1862.

This apparatus the patentee calls an odometer, or carriage distance indicator, and is such that it may be shown in a variety of forms. In the most complete of these arrangements he shows the termination of each mile by the sudden projection of a pin, stud, or other indicator, on the face of the instrument, so that it shall be readable by the touch when it cannot be seen, the total distance also being registered on a dial. In another arrangement he shows the distance by hands on a dial only, and the apparatus is also capable of being made both in form and size to resemble a watch. The indicator may be fixed in any part of the carriage, or may be held in the hand without at all interrupting the action of the instrument. The indicating portion of these instruments he connects with the driving part of carriage wheels by an air tube, and actuates them by a stud or other projection fixed to the stock of the carriage wheel, and which, at every revolution of the same, will be brought into contact with the driving part of the apparatus, which he calls the blower. This is fastened to the axle tree of the vehicle, and will force the air through the connecting tube into the air chamber of the indicator, and so give motion to that part of the instrument. *Patent completed.*

1342. B. COOKE. *An improved construction of implement for cutting turf.* Dated May 5, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1343. T. GABOURG. *Improvements in machines for the purpose of uniting together, by means of screws, leather used in the manufacture of boots and shoes and other articles composed of two or more pieces of leather.* Dated May 6, 1862.

This consists in the construction of a machine which will form a thread upon a continuous length of brass wire, at the same time cause it to penetrate by screwing in any portion of leather, or such like material, so as to unite them in one. *Patent completed.*

1344. R. MILLS. *Improvements in washing, wringing, drying, and mangling machines.* Dated May 6, 1862.

This consists in placing in the interior of the barrel of washing machines an oscillating beater, constructed with bars, or having perforations therein, or projections thereon, so that the materials to be washed may rub against the said bars or projections, and the water pass between the said bars or through the perforations. *Patent completed.*

1345. A. MOREL. *Improvements in heckling machines.* Dated May 6, 1862.

This consists in an arrangement of annular and other parts, which enables the patentee to multiply at will the parts working on the material, which is around a circle in optional proportions, thus increasing the working and consequently the production of the machine. The details of the invention are voluminous. *Patent completed.*

1346. G. BORTHWICK. *Certain improvements in the construction of ships and boats, and certain other floating bodies.* Dated May 6, 1862.

This consists in building the deck and other superstructure of the ship, boat, &c., upon two or more pontoons or water-tight cylinders, placed parallel to each other, one pontoon constituting the support of each side of the ship, boat, &c. The pontoons are to be firmly stayed inside, and connected and bound together on the outside, and are to support the superstructure of the vessel above the surface of the water. *Patent abandoned.*

1347. P. CHENAILLIER. *Improvements in apparatus for concentrating liquids, or for condensing alcoholic or other vapours.* Dated May 6, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1348. JOHN CLARK and J. RICHMOND. *Improvements in looms for weaving.* Dated May 6, 1862.

This invention consists in weaving textile fabrics, such as plain and fancy tweeds, doeskins, merinoes, silks, satins, sarcenttes, ribbons, scarfs, broad silks, broad cloths, shawls, handkerchiefs, and the like, in the following manner:—The patentees attach to each leash cord a number or series of loops and pattern cords, by which the patterns may be varied. The invention may be used in connection with the jacquard machine, satin jacks, or any other machine now in use, to make any kind or style of pattern, merely by the attachment or detachment of the pattern, cords, and loops which are placed above the compass board in the present loom. The levers are raised in succession by means of treadles. The same set of cords will make any pattern that may be desired, instead of requiring new cords, as in the jacquard machine. *Patent completed.*

1349. W. RICHARD and J. RICHARD. *Improvements in the manufacture of printing types, spaces, and quadrats.* Dated May 6, 1862.

This relates to adaptations or combinations of parts or means for effecting the operations technically called rubbing, putting up preparatory todressing, and dressing, and comprises much detail which we cannot quote here. *Patent completed.*

1350. J. H. JOHNSON. *Improvements in the manufacture and production of minium or red lead.* (A communication.) Dated May 6, 1862.

This consists in the conversion of the oxide of lead, when free or uncombined, and of certain base salts of lead, into minium or red lead, by mixing the same with either carbonate of potash or carbonate of soda, or mixtures of the same, and subjecting such mixtures to the action of an elevated temperature, whereby the oxide of lead is oxidized, and is converted into minium or red lead. *Patent completed.*

1351. W. GREAVES. *Improvements in safety stirrup bars* Dated May 6, 1862.

Here the stirrup straps are suspended from the saddle tree by bracket pieces, or bars rivetted to the saddle tree, each bar being provided with a spring lever, over which the strap hangs. These lever bars are made with a projection or tail piece forming an obtuse angle with the end, where the lower bars are jointed to the fixed bar, the spring or springs acting upon a rounded part of the lever bar, and tending to keep the lever bars shut down upon the fixed bar, in which closed position the end of the lever bar enters a slot or recess in the fixed bar, and protects the spring from wet. The part of the fixed bar which contains the spring bar inclines upwards slightly from the pummel of the saddle, and stands out clear of the side of the saddle, so as to allow the stirrup strap to slip off freely, should the strap be thrown over or across the seat of the saddle. Should the stirrup strap be dragged back and downwards, it will be drawn along the spring lever bar until it exerts a pressure against the tail piece, whereupon the lever bar will be elevated or inclined, and will instantly allow the strap to slip off the end and over the tail piece. The flap or support of the bar is so shaped and constructed that it affords great additional strength to the saddle tree, and thereby prevents the point or bar of the tree itself from breaking away. *Patent completed.*

1352. J. H. JOHNSON. *Improvements in the manufacture of soda and potash and of their carbonates.* (A communication.) Dated May 6, 1862.

This consists in mixing natural or artificial sulphate of soda, obtained by the decomposition of marine salt, chloride of sodium, by sulphuric acid, or by sulphate of iron, with about 35 per cent. by weight of powdered charcoal, or its equivalent of coal, anthracite, or other suitable reducing organic substance, and then subjecting this mixture to a red heat, either in closed vessels or in a reverberatory furnace under the influence of a reducing flame. The mixture is maintained at an elevated temperature so long as carbonic oxide is disengaged. When this ceases to be produced, and when the sulphate is transformed into a sulphuret, the operation is discontinued. The mixture is now allowed to cool, the air being excluded. The fixed mass is then treated with hot water. The solutions or liquors are now subjected to a boiling temperature with some sulphurizing agent. *Patent completed.*

1353. W. CLARK. *An improved buckle or fastening.* (A communication.) Dated May 6, 1862.

This buckle is formed of a frame in two parts of unequal length, jointed together, having several bridge or tie pieces, over and under which the strap passes; one end of the strap is connected to a bridge piece of the smaller part of the frame, and the end passing through the several bridges of the other and larger frame. In order to hold the strap, a cross bar or rocking piece is placed about midway of the larger part of the frame of the buckle, which, when tension is exerted on the strap, is caused to bear on it its whole width, and so retain it in its desired position. To unfasten the strap, it is only necessary to raise the larger end of the buckle on its hinged joint, when the strap is free to be removed. *Patent completed.*

1354. W. CLARK. *Improvements in cylinder printing apparatus.* (A communication.) Dated May 6, 1862.

This consists in a mode of printing called "flat-plate" printing, with a speed ten to twelve times greater than the ordinary mode of roller printing, and working with greater nicety. For this purpose the patentee uses rollers, the diameters of which may be as large as is required for strength,

but which present, on a limited part only of their circumference, the engraving intended to produce the impression with this essential peculiarity, that the engraved part (whether embossed or sunk), shall be on the surface of portions of cylinders, and project from the roller concentrically to its axis. These rollers are so disposed as to produce successfully, as regards the part on which they act, and simultaneously as regards time, the impression of the proper colour. The machine is so disposed that each printing roller only acts at the time the projecting part is passing which carries the engraving, they, during the rest of their revolution, exerting no action on the pressing cylinder, but, as the latter in its motion causes the fabric to advance to a greater extent than the space occupied by the impression of the design, a peculiar contrivance is employed, which turns the pressing cylinder in a backward direction, and, consequently, the fabric with it the exact quantity required for the next impression, to unite and correspond perfectly with the foregoing. *Patent completed.*

1355. J. E. RANSOME, W. COPPING, and L. LANSDELL. *Improvements in harrows.* Dated May 6, 1862.

According to this invention, the patentees make the fastenings of the teeth independent of the fastenings of the frame. *Patent completed.*

1356. W. E. NETHERSOLE. *Improvements in parts of railway trucks and waggons, parts of which are applicable to railway carriages.* Dated May 6, 1862.

Here the inventor proposes to make the draw bar, the ends of which are enclosed in a cradle, act upon springs of india rubber, which springs are to be attached or fixed on the ends of the side chain rods. On the ends of trucks the inventor places an end door or flap, which, when opened, forms a shoot for facilitating the tipping from railway waggons. *Patent abandoned.*

1357. W. JUDSON. *The use of caoutchouc or india rubber for, and its application to guns, mortars, and other fire-arms, to resist the forces of the recoil and re-action in firing.* Dated May 7, 1862.

Provisional protection has not been granted for this invention.

1358. E. BOURDON. *Improvements in the construction of blowing fans, which improvements are also applicable to centrifugal pumps for raising water and other liquids or gases, or for exhausting the same.* Dated May 7, 1862.

The patentee claims, 1, The construction of apparatus for raising, forcing, propelling, or exhausting air, water, or other fluids or gases, in which an external hollow casing, or drum, with or without partitions and vanes formed inside, is caused to rotate, and in which the air, water, or other fluid or gas enters the said hollow drum through one or more openings, and is caused to revolve with it, such air, water, or other fluid or gas being thereby thrown into the open end of a stationary tube or tubes, or their equivalents, situated inside the said revolving drum, through which tube or tubes the air, water, or other fluid or gas is conducted out of the drum again to where required. 2, The various arrangements of blowing fans, as described. 3, The construction of exhausters, with or without hydraulic joints, for use in gas works, or other localities, as described. 4, The construction of centrifugal pumps for raising water, or other liquids, or for regulating motive power, as described. *Patent completed.*

1359. C. V. T. DE BERVILLE. *An improved safety coupling bar for locomotives and other railway carriages.* Dated May 7, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1360. P. H. COLOMB. *Improvements in arrangements and apparatus for signalling.* Dated May 7, 1862.

This is applicable for communicating signals between vessels at sea and the shore, and for other purposes. The principle of its action consists in the use, for night signals, of flashes of light, separated by intervals of darkness, such flashes being of varying duration, and a certain number of long or short flashes, or the combination of a certain number of long with a certain number of short flashes, being taken to represent a certain number, letter, or other distinguishing character of any required or pre-arranged code of signals. *Patent completed.*

1361. T. MARKLAND. *Certain improvements in wearing apparel.* Dated May 7, 1862.

This relates to a mode of ornamenting and preserving the edges of various parts of dress or wearing apparel, such as collars, facings, and the brims of hats, and consists in applying to the edges of articles of this kind a beading composed of china clay, or other suitable and similar composition, such beading being grooved or clotted longitudinally to receive the edge to be ornamented, and formed either in a curved or other shape, and of one or more pieces, to suit the article to which it is to be applied. In some instances, as when used for collars for the neck, a broad tape may be employed, which has been previously prepared for the purpose by having a cord or enlarged selvage formed upon one edge, by which the beading is effectually secured to the edge of the collar or tape, the collar or tape being slipped into the slot in the beading from the end longitudinally, and a corresponding enlargement being formed in the slot to receive the cord. The beading is produced in lengths to suit the article to which it is attached, thereby allowing the beading to yield without breaking. *Patent completed.*

1362. T. H. HOPWOOD. *Certain improvements in the means or apparatus to be employed for the purpose of raising sunken vessels, or other submerged bodies, and also in the application of a self-acting balance and regulator to the pontoons used therein.* Dated May 7, 1862.

This consists in a novel arrangement, application, and construction of pontoons, or air cylinders, for raising sunken or stranded vessels, or other submerged bodies, or for raising vessels in dock for repair; and, further, in the use and addition of a balance and regulator to such pontoons, to retain them in any position required whilst submerged. *Patent completed.*

1363. C. CLARK. *An improved cigar tube.* Dated May 7, 1862.

This consists of a hollow mouth-piece, terminating in a small tube, perforated, pointed, and barbed. In using this mouth-piece, the piercer (or pointed end) is inserted at the end of the cigar, or at the side, if necessary. *Patent abandoned.*

1364. N. WOOD and J. STOCKLEY. *Improvements in grinding, smoothing, and polishing plate glass.* Dated May 7, 1862.

This invention has reference to a previous patent, dated November 16, 1860 (No. 2,815), and comprises arrangements for causing the bench or table on which the glass rests to travel longitudinally, such motion being imparted by a rack and pinion, or worm-wheel and screw, or screws and nuts. The bench or table is set level by adjusting keys. The upper portion of the bench or table is raised or lowered by eccentric rollers, mounted on the under frame, and special contrivances are used to give the requisite lateral motion. The apparatus also consists of an upper portion, on which the glass rests, and an under frame, supported on flanged wheels, bearing on fixed rails. The polishing cylinders are made with a metal or wooden core, covered with several pieces of felt, seamed and pressed together, and formed into pieces wedge-shaped in cross section, and set radially round the core. The details of the invention are voluminous. *Patent completed.*

1365. J. J. CORDWAINER and A. CHAPMAN. *Improvements in apparatus for preventing collisions on railways.* Dated May 7, 1862.

This consists, 1, In a method of constructing retarding breaks, which can be made self-acting, and are intended to be fitted to the break van, and to all carriages, or to any required number of carriages of a train. 2, In a method of constructing a stopping break, which can be applied at any moment, and may be used apart from the retarding break, or in conjunction therewith. 3, In an arrangement of gearing for actuating the above breaks. The details of the invention are too elaborate to be quoted here. *Patent completed.*

1366. R. A. BROOMAN. *An improved box or apparatus for containing and igniting matches.* (A communication.) Dated May 7, 1862.

This box or apparatus consist of an outer cylinder and of an inner cylinder, formed with vertical compartments all round, each intended for the reception of one match or taper. The top of the inner cylinder is toothed, and a pawl takes into the teeth to prevent its being moved beyond the extent of one match compartment at a time. A stud rising through the top of the box is connected by a coiled spring to the inner cylinder. A tube containing a helical spring is fitted at the side of the outer cylinder. The spring has fitted to the top a block or table, which projects inwards, and moves up and down in a slot in the tube. There are also connected to the top of the spring two finger pieces for the purpose of depressing the spring and block. The matches are placed in the compartments with the prepared ends upwards, and the apparatus is worked thus:—Depress the helical spring, when the block will be taken below the level of the bottom of the matches, turn the inner cylinder, when one match will be brought over the block, release the spring, and the match will be forced up in the compartment, and the prepared end passing through spring jaws in the upper part of the apparatus, will become ignited by the friction in passing through them, and the lighted match will be presented and held ready for use. The internal cylinder may be fitted with holders for containing cigars, sealing-wax, or any other article. *Patent abandoned.*

1367. R. A. BROOMAN. *Improvements in swings.* (A communication.) Dated May 7, 1862.

The object of this invention is to construct a swing which can be operated by the hands or by the feet, or by the hands and feet combined, of the person or persons seated in it. The inventor attaches ropes, straps, or bands in front of and behind the ordinary point of suspension, their lower ends reaching and being attached to a moveable cross bar or sliding thimbles placed a few feet above the seat; a rope or strap, with a loop or handle, to be taken hold of and pulled by the person or persons seated in the swing, is suspended from the cross bar. He attaches a footboard beneath the seat, the front of which is connected by a rod or rope to the cross bar. The seat is suspended in the ordinary manner. On the person or persons seated in the swing pulling the rope suspended from the cross bar, or pushing the footboard with the feet, or using both hands and feet, the swing will act or be set in motion. The cross bar is, by preference, made to slide on the ordinary suspension rods or ropes. *Patent completed.*

1368. J. COMBE. *An improved machine for spreading and drawing into sliver: flax, hemp, jute, and other fibrous substances.* Dated May 7, 1862.

This consists in arranging mechanism so as to cause the fibrous substances to be fed into the machine in a direction transverse to the fibres, parallel to the axes of the drawing rollers, and so that the fibres are taken hold of by the drawing rollers sideways, by which a more equal and uniform sliver is produced than by the old machine. *Patent completed,*

1369, G. T. BOUSFIELD. *Improvements in applying steam power to tilling land by means of a digging locomotive.* (A communication.) Dated May 7, 1862,

The object here is to enable a digging locomotive to be directed with great facility, and the invention consists in securing the front pair of wheels to separate upright spindles, which can be turned simultaneously in the same direction, to cause both wheels to assume the desired obliquity to the frame of the machine. Another object is to enable a digging locomotive to be turned with facility in a short space, and consists in combining two independent driving wheels at the opposite sides of the carriage with the driving mechanism, so that, by raising the carriage upon one of the said wheels a greater distance than upon the other, one of the said wheels is put into gear with the driving mechanism, while the other is not, whereby the driven wheel can propel the carriage round in a circle nearly concentric with the opposite and independent wheel. *Patent completed.*

1370. J. HALEY. *Certain improvements applicable to ships, boats, and batteries.* Dated May 7, 1862.

This consists in applying to the exposed parts of ships, boats, and batteries, plates and bars of iron, steel, or other metal, single or combined, which plates and bars shall exhibit angular projections called cutters, formed either upon or attached to the said plates and bars in a vertical, horizontal, or diagonal directinn, or otherwise, and so tempered as to resist and destroy any projectile that may come in contact with the same. *Patent abandoned.*

1371. W. COSSAGE. *Certain improved apparatus to be used in the manufacture of soap.* Dated May 7, 1862.

The patentee claims the construction of apparatus to be used in the manufacture of soap, which provides for withdrawing the contents of the pans or vessels used in such manufacture, by causing the pans to be closed with lids or covers, and subjecting such contents to the pressure of steam or air on their surface, so as to the same to be elevated or driven through a pipe or pipes communicating with the interior of such soap pan or vessel. *Patent completed.*

1372. D. MARCHAL and A. C. DE WIART. *An improved method of preventing the destructive effects of vibrations or jar on the permanent way of railways, and on the wheels, axletrees, and other parts of carriages, and the working and other parts of machinery liable to shocks.* Dated May 7, 1862.

This consists in the application to those parts which are liable to shocks of a band, plate, washer, or lining of lead, tin, zinc, copper, or an alloy of these metals, or either of them. The same principle for neutralizing the effects of concussion, may be applied to various parts of machinery, and to the bearings of iron bridges. *Patent completed.*

1373. J. MCCANN. *Improvements in the mode of, and apparatus for, dressing, cooling, and cleaning grain.* Dated May 7, 1862.

The patentee claims, 1, The general construction and arrangement of apparatus for drying cooling, and cleaning grain, as described. 2, The system of drying and cooling grain by causing it to descend through long cases of wire gauze, perforated metal, or other suitable permeable material, whilst under the influence of currents of hot or cold air, according as the condition of the grain may require, as described. *Patent completed.*

1374. J. HAY. *Improved arrangements to facilitate the cleaning and repairing of ships' bottoms.* Dated May 8, 1862.

This consists in applying weight above the centre of gravity to one side of the ship, until that side is brought sufficiently down in the water to cause the opposite side of the bottom to be exposed as far as necessary. The arrangements for effecting this, according to one modification, consists in forming water-tight compartments or casings along the inside of the ship's bulwarks, or at as high a part of the ship's side as it is possible or convenient. Pumps, arranged to be worked by manual, steam, or other power, are provided, along with sets of pipes and valves for filling the compartments or casings with water, to depress the side of the ship, and discharge valves are likewise provided for emptying the compartments when the ship is to be righted again. *Patent abandoned.*

1375. W. P. GAULTON and M. BOOTH. *Improvements in apparatus or machinery for damping and steaming fabrics, part of which improvements are applicable for distributing fluids for other purposes.* Dated May 8, 1862.

This consists in the use, in place of the rotating brush, of a series of jets, each of which is formed like the flat flame gas burner. These jets are fixed or formed in, or communicate with, a pipe placed at right angles to the direction in which the fabric passes, and the water or fluid is supplied to the pipe from a cistern fixed at a sufficient height, and giving a constant pressure, which cistern may be filled by a pump, or other means. The inventor employs moveable boards or obstructions, so as to cut off all or any portion of the stream of water or fluid delivered by the jets, so that the quantity of water or fluid thrown upon the fabrics may be properly regulated. *Patent abandoned.*

1376. W. RIDDLE. *Improvements in hydraulic and other presses in packing machinery, and in treating cotton and other fibrous substances.* Dated May 8, 1862.

This invention relates to the doors and apparatus (where the packed bale is delivered), of a hydraulic or other form of press, for packing cotton, &c., the object of the invention being more advantageously to introduce and bend or fold the metal bands, by which the bale is to be bound or hooped. *Patent completed.*

1377. A. BEARNE. *Rendering the heels of boots, shoes, and goloshes elastic to pressure.* Dated May 8, 1862.

In constructing the heels of boots, shoes, and goloshes, the inventor hollows out the heels internally, and places within the cavity an elastic bed or cushion, or bed or cushion of vulcanite, or other suitable material of a sufficient size to present an elastic medium when pressed upon by the heel of the wearer; a thin covering of leather or other suitable material is placed over such cushion. *Patent abandoned.*

1378. W. SOUTHWOOD. *Improvements in machinery for pulverising ores and extracting metals therefrom, part of which is applicable to breaking stones.* Dated May 8, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1379. J. FOWLER and J. KING. *Improvements in apparatus for tilling land by steam power.* Dated May 8, 1862.

In tilling land by steam power, it is frequently desirable to use the ordinary agricultural steam engine, provided it can be done without altering or fitting the agricultural engine. By this invention this is very conveniently done by mounting hauling apparatus, or apparatus which gives motion to the rope for actuating the tilling implement on a carriage with disc wheels, as is now used to carry the pulley round which the rope passes when it arrives at the headland opposite to that on which the engine traverses. The disc wheels, by cutting into the land, enable the "hauling carriage" to offer sufficient resistance to a sideway strain to allow of its drawing the tilling imp'emen without itself moving in the direction of the strain. In place of disc wheels, coulters, or plates, cutting into the

land, may be used. The hauling carriage, when at work, is coupled with the engine, preferably with a flexible coupling, and the hauling apparatus is driven by the engine. On the hauling carriage is a small drum, which receives motion from the driving power, and winds up a rope laid out along the headland, thus drawing the hauling carriage forward and also the engine with which it is coupled. *Patent completed.*

1380. P. TATE. *Improvements in smelting furnaces.* (A communication.) Dated May 8, 1862.

Here the patentee builds smelting furnaces, the horizontal section of the interior of which is of an oblong, rectangular form, the interior being of that form at any point of its height. The lengthened or oblong form of the parallelogram described is such that two sides of the furnace are extended to a considerable width, and disposed comparatively near to each other, and at which sides he introduces the tuyeres, there being a series thereof distributed through the entire length of the sides. These tuyeres are so arranged as not to be directly opposite to each other, but the one to be midway between each two on the opposite side. In the ends of the furnace he disposes the apertures for drawing off the metal. *Patent completed.*

1381. C. LUNGLEY. *Improvements in apparatus for manœuvring ships and vessels.* Dated May 8, 1862.

This apparatus consists of a blade or other instrument, or of two or more such blades or instruments, caused to reciprocate or move with a to and fro or oscillating motion, by means of a steam-engine or other motive power, and to change its or their inclination at each reciprocation, in order that the full manœuvring effect may be exerted upon the vessel to turn her in any direction desired. The apparatus may be fitted either on the sides, or under the quarters, or at the bow; but the patentee prefers to place it at the stern near the propeller in screw propelled vessels. The steam-engine of the vessel may be used to work the apparatus, or an auxiliary engine may be applied. The apparatus may be used either as a simple rudder or as two or more rudders, instead of the ordinary rudder, or for forcibly manœuvring a vessel and changing her direction. *Patent completed.*

1382. G. C. GRIMES. *Improvements in the manufacture of cigar lights, splints, matches, and tapes or vestas, and in machinery or apparatus employed therein.* Dated May 8, 1862.

This invention relates, 1, To the manufacture of cigar lights, adapted particularly for striking into the ends of cigars before ignition. The patentee mixes and grinds a pastile composition, which may be such as ordinarily used in the manufacture of cigar lights, but to which he adds fine charcoal in powder, or cascarella or other powder adapted in quantity to form a sufficiently plastic composition that will admit of being rolled into a thin cake, the quantity of powder required being readily ascertained by adding it in small quantities till the desired consistency is obtained. The improvements relate, 2, To cigar lights formed on splints, and consist in saturating or coating the splint upon which the pastile composition is applied with a solution or coating of ignitable matter or composition, such as chlorate or nitrate of potash. The improvements relate, 3, To dipping the ends of splints, upon which pastile composition is to be applied, in a resinous or waxy matter, or composition that will not readily melt, at ordinary temperatures, but which, when pastile composition applied thereon is ignited, will, by the heat thereof, admit of the splint slipping out, and leaving the ignited matter in or on the cigar. Common wax answers the purpose very well, but it is made harder and more suitable by the addition of a little resin or such like substance, and he mixes a little of some agreeable scent with it to neutralize or qualify the smell from the wax or resin employed. He then dips these prepared ends of the splints in the pastile composition, and furnishes them in the usual way. The improvements relate, 4, To the manufacture of cigar lights by substituting for wood or metal splints the use of cotton or other suitable fibrous material, coated with wax, stearine, or other composition, as in the manufacture of tapers or vestas, by combining with the wax or stearine, or other coating employed to the fibre, charcoal and scent with ignitable substance, as chlorate or nitrate of potash, amorphous, phosphorous, separately or combined, so as to make a light to burn with a flame or only to smoulder. The improvements relate, 5, To means of forming wax stearine or other composition tapers or vestas. The improvements relate, 6, To means for cutting splints. The improvements relate, 7, To means or apparatus such as for which letters patent were granted to the present patentee and George Bell, on the 21st December, 1854 (No. 2691), in which bars or pins are used to act by their ends upon the ends of splints in a trough to push such pins into clamps. *Patent completed.*

1383. A. P. PRICE. *Improvements in straps or bands for securing articles, parcels, or luggage.* Dated May 8, 1862.

This invention consists in imparting a certain amount of elasticity to such straps or bands by introducing therein a length or lengths, a ring or rings, or other suitable arrangement, of vulcanized india rubber, or other similar elastic material, whereby the force necessary for the tightening and securing of the strap round any articles, parcels, or luggage, is considerably reduced, whilst the elasticity of the vulcanized india rubber, or other similar elastic material employed, tends to contract the strap firmly over the article or articles after the buckle or fastening has been secured. *Patent abandoned.*

1384. A. KINDER. *Improvements in the manufacture of sheet metal.* Dated May 8, 1862.

This invention relates to an improved and combined process for the manufacture of sheet metal or foil from blocks of lead, tin, or other soft or ductile metal, capable of being acted upon by a cutting tool or knife and rolls. According to this invention, the inventor proposes to produce sheet metal by the combined operations of cutting and rolling; and in carrying out the same, he first produces a sheet of metal by cutting it from a cylindrical block or pig, by means of a suitable knife or cutter, after the manner described in the specification of H. W. Winsburst, dated the 1st of July, 1858 (No. 1,481), and after a sheet has been so formed, or during its formation, and as fast as it proceeds from the cutting machine, he proposes to pass it between one or more pairs of rolls, which, by exerting a pressure upon the sheet, tend to condense it and render it more homogenous in its texture. The sheet is primarily cut thicker than is required for use, and it is then consolidated and reduced in thickness by the subsequent rolling process. *Patent abandoned.*

1385. L. DE LA PEYROUSE. *Improvements in treating neutral and acid fatty or oily substances, resins, and resinous substances, and compounds or products containing paraffin.* Dated May 8, 1862.

This invention consists in subjecting the above-mentioned substances, compounds, or products containing the same, to the action of azota sulphuric acid, or of sulphuric acid containing azota sulphuric acid in solution, and to the products of the decomposition of azoto sulphuric acid by means of water, and also to the products of its decomposition by means of water and of organic matters. The invention further consists in subjecting the substances before mentioned to the action of a salt, or compound of nitric acid, such as nitrate of soda, or any other suitable nitrate, in conjunction with sulphuric, or any other suitable acid, with the addition of a reducing substance or agent, such as treacle, sawdust, starch, or any other suitable reducing agent, so that when these substances react upon each other, the nitric acid may be reduced, and the desired compound of nitrogen may be produced. The improvements also consist in subjecting the substances and products firstly, before mentioned, to the action of a nitrate, such as nitrate of soda, or any other suitable nitrate, in conjunction with an acid, such as sulphuric acid. *Patent completed.*

1386. N. THOMPSON. *Improvements in barometers.* (A communication.) Dated May 8, 1862.

This invention applies to mercurial barometers, and comprises improvements by which they may be made portable. In carrying out the invention the inventor prefers to take a 36-inch glass tube, sealed at one end, and having a syphon at the other end; a metal air-tight stop-cock is connected to one end of the syphon by an india-rubber metallic tube, also air tight, and a glass bulb or fountain is likewise connected to one end of the stop-cock by a similar india-rubber air-tight tube, the other end of the glass bulb being covered with chamois leather to admit air. The glass tube is to be filled with clean, pure mercury, and the bulb two-thirds full; the tube can then be framed according to taste, and worked by a scale and vernier by means of a screw 20 turns to an inch at the upper end, or by means of a rack or pinion, and a thermometer placed in the front or at the side of the scale. He hangs the barometer plumb, then turns the thumb-screw in the back to a perpendicular; the mercury in the tube will then descend to a proper level to render the instrument portable. He inclines it gently to an angle of 45 deg., when the mercury will completely fill the tube, then turns the thumb-screw directly across the instrument, when it may be carried with safety. *Patent abandoned.*

1387. G. F. GREINER and J. H. C. SANDILANDS. *Improvements in the construction of pianofortes.* Dated May 9, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1388. MCILROY. *An improved invalid bedstead.* Dated May 9, 1862.

In carrying out this invention the hollow part is hinged at about one-third of the length from the head, for the purpose of being raised or lowered, for the comfort and convenience of the invalid, by means of the following combination of pinions and segments:—A shaft runs across the bedstead, having two cog wheels, which shaft is turned by a handle at either side of the bedstead; there are two segments, one on either side of the bedstead, which work in the two cog wheels, which segments are fastened to the frame which raises up the invalid, and also by means of the following combination of cords and pulleys:—There is a bearing from the top part of the bedstead in which is attached a pulley; a pulley is also attached to the part of the frame which is raised up, and a cord passes through the pulley enabling the invalid to raise himself to any inclination, and to remain at any required elevation. There is a ratchet wheel attached to the shaft which passes across the bedstead, and a pawl or catch fastened to the bed rail drops into the ratchet wheel and retains the bed at any elevation, and prevents it falling back. *Patent abandoned.*

1389. L. D. AUBREVILLE. *A new kind of metallic cross sleepers for the construction of railways.* (A communication.) Dated May 9, 1862.

These improved railway metallic cross sleepers are composed of two plates or sheet iron pieces about 10 in. wide, 50 to 54 in. long, and from 2 to ⅜ths of an inch thick. The edges of the said plates are bent at right angles so as to form flanges to the longest sides of the plates, these flanges being turned downwards. Two holes are punched through the plates to correspond to those of the cast iron chairs for the bolting or fastening of the said chairs; a piece of wood about 4 in. thick is inserted betwixt the plate and chair, and they are bolted fast together. This wooden sole must be of the same size as the seat or sole of the chair, or a little longer. Two chairs, adjusted in the same manner, are connected together by means of a flat iron bar of a suitable thickness, and the required length for the breadth of the way. *Patent completed.*

1390. T. K. MACE. *Improvements in guards or protectors for hats and other coverings for the head.* Dated May 9, 1862.

This invention consists of a guard or protector for retaining the hat or head covering when by wind, accident, or otherwise it is removed from the head, the said guard or protector being used in place of the cord commonly used for the same purpose. In making a guard or protector, according to this invention, the patentee takes a small flat circular box similar to that of a measuring tape, the said box having a reel in its interior on which is wound a tape and or other flexible line. The reel may be turned so as to wind or unwind the tape, cord, or line, either by a winch on one end of its axis, or by fixing one of the circular sides of the box to the said axis, or to the reel, and making the said side capable of rotation. Or the reel may have a coiled spring by which the tape, cord, or line is wound up when its end is loosed, as in the spring measuring tape. *Patent completed.*

1391. W. EDDINGTON. *Improvements in portable grinding, chaff-cutting, and corn-crushing machinery.* Dated May 9, 1862.

This invention consists, 1, In fixing a grinding mill and a chaff-cutter, with or without an oat or a bean crusher, on one framework mounted on travelling wheels. By suitable gearing and clutches attached to the main driving shaft, either one machine or all may be worked at one time by means of a band passing round a rigger fixed to the main shaft, or by any other suitable way of deriving the power from an engine. The invention consists, 2, In so placing a lever to bear on the top of a spindle fixed to or connected to the centre of the top running stone that, by applying a small weight or spring balance to the longer end, it may cause the top stone to press hard on the lower one. *Patent abandoned.*

1392. F. F. B. MAYALL. *Improvements in dyeing mixed or plain fabrics and yarns.* Dated May 9, 1862.

In carrying out this invention, the inventor dyes mixed fabrics or yarns, such as a mixture of silk, cotton, woollen, worsted, and linen, at one operation, either black, drab, claret, brown, olive, and other colours, in not more than one to three vats, as may be required; or he dyes fabrics made of any one of the said materials separately in the same way. For this purpose, instead of using a number of vats, and, consequently, a number of separate processes, as at present adopted, he never exceeds 3, and in all ordinary cases, only 2; for example—in dyeing either mixed or plain fabrics black, in No. 1 vat, he uses chipped or ground logwood, brown sugar of lead, manganese, and ammonia of copper, with a little fustic chipped or ground. The heat of the water, and the proportions of the different materials used, must vary according to the substance of the articles to be dyed. No. 2 vat, which is a finishing or cleaning process, is composed of a solution of neutral chromate of potash, and bichromate of potash added if necessary, or for some shades a little ammonia or sulphur of iron. *Patent abandoned.*

1393. J. F. BLAND. *An improved method of, and apparatus for, signalling between targets and shooters.* Dated May 9, 1862.

This invention consists in the employment of an index or scale set in front and below the base of a target, at a convenient distance therefrom, say twenty yards, the numbers thereon corresponding with lateral divisions on the target, and in the employment of an indicator, consisting of a rod carrying a disc, numbered to correspond with vertical divisions on the same. To indicate the point at which the bullet strikes the target, the indicator is raised vertically by the marker at the number on the index, No. 3, for example corresponding with the lateral division on the target where the bullet has hit, and to such a height as to show a number 1, 2, 3, as the case may be, corresponding with the vertical division on the target in which the bullet has hit. To apply these signalling apparatuses, the inventor prefers to form a pit or excavation in front of the butt, so as to allow the indicator to appear above the ground, which is roofed over, leaving a space open in front. The index or scale is fitted on a level with the base of the target, and corresponding with the divisions thereon as before described. The earth is shelved off round the pit to throw water off. When the shooting is not being carried on, he covers the pit entrance, an open space as already described, and the pit with wood or otherwise. *Patent abandoned.*

1394. T. FAWCETT, JUN. *Improvements in plated fabrics for shirt fronts and other uses, and in the mode of mechanism for manufacturing the same.* Dated May 9, 1862.

This invention relates to improvements in shirt fronts and other plaited fabrics, and consists in producing, instead of the rough uneven fabrics hitherto produced for shirt fronts and other plaited articles of the same character, a smooth and even fabric, containing, however, the same quantity of warp in the parts intended to be exhibited when in wear, giving the cloth a better and more uniform appearance, costing much less, and being much better adapted for its purpose than fabrics made according to the methods heretofore practised. *Patent completed.*

1395. J. OXLEY. *Improvements in apparatus for facilitating the process of washing and sparging in breweries and distilleries.* Dated May 9, 1862.

This invention has for its object the raising in temperature of the contents of the mash tun by drawing the wort from the bottom thereof, and conveying it to a pan or receiver where it is heated by steam, and thence discharged through the sparger (specially constructed), over the grain contained in the tun. *Patent completed.*

1396. T. WELTON. *Improvements in the preparation of beverages in connection with brewing.* Dated May 9, 1862.

This invention relates to the manufacture of a new series of beverages or drinks. The base is to be of beer or ale brewed in the usual manner of malt (but the inventor prefers pale malt), with or without hops; he then mixes or flavours the same with the vegetable juices, syrups, or flavourings extracted or expressed from fruits or dried fruits.

These fruit juice flavourings may be mixed either at the time of mashing the malt, or afterwards, as at the time of fermentation, or after fermentation has ceased. The fruits he prefers are cherries, raspberries, strawberries, and pine apples; and of dried fruits, raisins, prunes, and figs. By this invention he manufactures beer or ale flavoured with any desired fruit, thus producing a series of new beverages or drinks. *Patent abandoned.*

1397. N. SYMONS. *Improvements of all kinds of wheels, framework, girders, columns, and stauncheons, blades of blowing fans, and paddle-wheels for steam-vessels.* Dated May 9, 1862.

This invention (which cannot be described without reference to the drawings) refers to a mode for a better distribution of all metals by means of corrugations, indentations, or grooves, or in any other form or shape that will increase the strength without adding to the weight, thereby equalising the expansion and contraction of the said metals. *Patent abandoned.*

1398. F. J. BOLTON. *Improvements in telegraphing for naval, military, and other purposes, and in the apparatus connected therewith.* Dated May 9, 1862.

This invention relates to a means of transmitting intelligence, or despatches, in broad daylight, by means of signals produced by flashes of light of long or short duration, or both combined. This object is effected by the employment of an intensely powerful light, consisting either of the electric light, the lime light, or other light, which is to be alternately obscured or eclipsed and displayed, so as to produce visible flashes of light of long or short duration, and in any desired order of succession, so as to produce the required signals. In combination with this light the patentee uses lenses, reflectors, or other well-known optical arrangements, in order to prevent the dispersion of the light, and to more efficiently concentrate or project it in the form of a pencil of rays of light upon the distant station or observer. *Patent completed.*

1399. F. J. BOLTON. *An improved mode of, and apparatus for, displaying the lights in lighthouses.* Dated May 9, 1862.

This invention consists in adapting or applying to the lamps or burners of lighthouses any convenient contrivance whereby the light may be alternately obscured and displayed at such intervals, and for such different periods of time as, by a pre-arranged system of signals, will indicate a code, number, or the name of the lighthouse, so that the latter may be instantly identified. These signals are to be repeated continually at regular intervals, so that the mariner, when at sea, will (upon coming suddenly upon this light), be able at once to know what is the code, number, or name of the lighthouse, and may therefore ascertain his exact locality without risk of making a mistake. The obscuration of the light may be effected by rising and falling shutters, discs, or other analogous contrivances, actuated by clockwork or other mechanism, or by means of an opaque cylinder perforated in a suitable manner to give the required flashes as it passes in front of the light, or as it rises and falls at the proper intervals. The system of flashes of long or short duration being pre-arranged to represent numerals or letters, the particular code, number, or name of each light will distinguish it from any other light. *Patent completed.*

1400. G. O. HASELER. *Improvements in lockets.* Dated May 10, 1862.

The patentee claims, 1, Making lockets of two loose and unconnected parts, as described. 2, Forming a recess or recesses on each side of a leaf or frame, with perforated or roughened backs, and securing or fixing the portraits or other designs thereon by means of cement, as described. And, lastly, he claims the application of a material known as "parkesine" as a substitute for glass in the manufacture of articles of jewellery. *Patent completed.*

1401. J. G. WILLANS. *Improvements in the treatment of the product from iron blast furnaces.* Dated May 10, 1862.

This invention consists, 1, In rendering pig or cast iron more conveniently malleable by causing an intimate intermixture therewith of unsqueezed puddled iron, or of crushed puddled ball or oxide of iron (alone or in combination), and causing the mixture to pass through and in contact with burning carbonaceous matters or gases, to which atmospheric air may be applied by a draught or apparatus. And also in collecting the fused metal in moulds passed before or under the tap-hole, consecutively, or having it sufficiently heated for amalgamation in a pot or reverberatory furnace. 2, In the abstraction of carbon from iron castings, by heating them in contact with a fused oxidizing substance, which consists of a metallic oxide (alone or in combination), not volatile, but fusible, at a lower temperature than the castings, such as may be obtained by the use of oxides of lead or iron. 3, In solidifying and rendering iron castings (whether more or less decarburetted or otherwise), more tough by compressing them out of the original moulds, as follows, viz, by applying the required pressure on some suitable substance surrounding the same (when heated or otherwise), capable of transmitting the pressure to the different surfaces of the casting without damaging its form, such substance being either gaseous, fluid, pulverulent, elastic, or compressible into shape. *Patent abandoned.*

1402. J. F. MILWARD. *Improvements in breech-loading firearms.* (A communication.) Dated May 10, 1862.

This invention cannot be described without reference to the drawings. *Patent completed.*

1403. W. CLARK. *Improvements in the application of a vegetable fibre alone, or in combination with other matters, in the manufacture of felted and other fabrics; also as a substitute for flock or powdered wool, and as a material for padding or stuffing, and for other useful purposes.* (A communication.) Dated May 10, 1862.

This invention consists in the employment of the down of the "Typha"—an aquatic plant—for the manufacture of felt for hats, shakos, police hats, and, when mixed with silk, wool, &c., for woven fabrics. *Patent completed.*

1404. R. MOORE. *Improved apparatus for indicating the presence, position, or accumulation of liquids, gases, or vapours, and apparatus for preventing danger or damage consequent thereon.* Dated May 10, 1862.

The object of this improved apparatus is to transmit from mines, holds of ships, tanks, and other enclosed, confined, or open places, signals indicating the presence, position, accumulation, or increase of liquid, gas, or vapour, mainly with a view to the adoption of timely measures for the exhaustion, circulation, diversion, exclusion, or removal thereof, to prevent or diminish danger or loss, and, in some cases, to put in action self-acting contrivances for effecting such exhaustion, circulation, diversion, exclusion, or removal. The means of transmission which the patentee employs for the purpose, and which he calls "transmitting media," consist of electric, electro-galvanic, or electro-magnetic currents of liquid, mercurial, or atmospheric pressure, of rods, wire, cords, or levers, or any combination of two or more of them acting on signalling contrivances—that is to say, on indicating dials, plates, or scales, or on bells, tympans, springs, or detonating or explosive contrivances, or other alarms, whether registering or otherwise. *Patent completed.*

1405. R. MOORE. *Structure and appliances of ships and other vessels.* Dated May 10, 1862.

According to this invention the patentee substitutes iron, or other metallic substance, corrugated either transversely, longitudinally, or diagonally, for the materials now usually employed in constructing or fitting up certain parts of ships or vessels. He employs apparatus for steering from below the water line without prejudice to arrangements for transmitting power from the deck, whether by the ordinary rudder or transverse screws. This he effects by rods, bars, or equivalent contrivances passed through stuffing boxes, or by wheels or chains working in water-tight cases or boxes, the said wheels, chains, rods, bars, or contrivances receiving their motion from the interior of the ship below the line of floatation. As an auxiliary in steering under certain circumstances he employs centre boards or plates, one at or near the bow, and another at or near the stern, so connected in their action that the lifting of the forward one and the lowering of the after one, and reversing, will make the vessel turn by her stern, and *vice versa*. He employs magnetic indicators for steering or laying the vessel's course, or correcting the magnetic variations of such indicators, or of the radiated card or table commonly called the mariners' compass. For this purpose, he uses three or more magnets, peculiarly secured or suspended in one instrument, but not necessarily in the same plane, and which indicate approximately the natural direction of the magnetic current. For cranes of ships, or other floating bodies loading and discharging, instead of the usual jib or derrick hoist, he constructs moveable travelling cranes, with rolling carriages, and other necessary adjustments, characterised by a system of levers, tilts, or lifts, by which the load is shifted in the desired direction for loading or discharging. He uses double or shifting shafts for driving propellers, and with the appropriate gearing and appliances therefor, and he connects the propeller to such shafts so as to be applicable for working partially below the line of keel or bottom of the vessel. He removes accumulations of water and dangerous gases and foul air from the holds or other parts of vessels by apparatus having projecting tubular or hollow arms or branches, the section of whose orifices is at right or oblique angles, or nearly so, to the axis of the column or conduit by which the gas, air, or water is raised or expelled, which arms or branches work in the fluid gas or air to be carried off. He employs, for ventilating ships or vessels, tubes varying in their application according to the direction to be given to the current of ventilation, but having for each circuit an induction and an eduction post. He uses gutta percha, caoutchouc, or other elastic or tenacious material, alone or in combination with other materials, as well as solid metallic or other substances, for filing, facing, coating, or lining corrugated metals used as before mentioned. *Patent completed.*

1406. J. T. COOKE. *Improvements in battens used in weaving.* Dated May 10, 1862.

These improvements consist of a new arrangement of driving planks for carrying the shuttles from side to side of their work, as hereafter described. The patentee uses two driving planks or bars, which are fitted with pegs in the ordinary way. One of the driving planks is sufficiently long to allow of a block being fixed on each end, so as to allow the other plank just to fit in between them, so that neither plank has any lateral motion apart from, or independent of the other. Or on one of the planks may be fixed a stud, to work in a slot in the other plank, sufficiently deep to allow of the rise and fall of each plank. The object of this arrangement is to secure the planks together, so that they both may travel the whole distance of the space and race, the motion being arranged in such manner as to allow them to do so instead of one driving plank taking the shuttle half its distance, and then standing still while the other plank takes it in the other half. The motion of these driving planks is cut and arranged in such manner that the driving plank in work carries the shuttle at work half its distance, and then falls from the shuttle sufficiently low to allow the peg to run under the piece or warp, but keeps travelling with the other plank at work, which rises into the shuttle at the same time the other is falling from it; the pegs are always either in the shuttles or just under the holes in which they work. The planks never stand in the middle, but traverse the whole distance from side to side with the shuttle, and thus prevent the jar and sudden motion of leaving one plank or bar at half the distance, and taking it up again in the return course. The invention is applicable to one or more tiers of shuttles. *Patent completed.*

1407. R. WILLOUGHBY. *Exhibiting and giving rotatory and traversing motion to placards, advertisements, scenes, &c.* Dated May 10, 1862.

This invention relates to an improved system of apparatus for exhibiting in public places and thoroughfares, within and upon the fronts of buildings, and other suitable places, advertisements, scenes, or other objects in a more efficient manner than is now performed. The improved apparatus consists of 3, 4, or more cylinders of any suitable length and diameter, placed in triangular, quadrangular, or other convenient position, and upon metal axes. Over these cylinders the inventor passes an endless band of cloth or other material, on which he fixes or places the object to be exhibited. He gives motion to one of the cylinders either by hand or power, and thereby imparts rotary motion to the rest of the cylinders. The endless band is guided by tapes and rollers of the number and size required by the length of the band, and the space or opening for the exhibition of the advertisements, or other objects. He also uses, when required, vertical supports made of metal or other material secured at intervals to the band, and to which he attaches pulleys; also a rail made of suitable material, along and upon which the endless band is caused to traverse through one window or opening in the building, along the front, and in at another window or opening. *Patent abandoned.*

1408. H. D. TAYLOR and E. ROBINSON. *Improvements in piece-dyed woollen fabrics, &c.* Dated May 10, 1862.

This invention consists in certain methods of producing blue selvages on piece-dyed fabrics, whether such fabrics consist of wool alone, or of wool mixed with any other fibre or material. *Patent abandoned.*

1409. J. HOUSE. *Apparatus for crushing or reducing substances.* Dated May 10, 1862.

This invention relates to a peculiar construction and arrangement of machinery or apparatus for crushing or reducing and working various substances, such as guano, grain, oil cake, clay, mortar, and cements. According to this invention, it is proposed to employ a pair of peculiarly constructed rollers, driven either at the same or different speeds, in relation to each other, by any suitable arrangement or gearing. These rollers may be either made in one or more parts, and composed of steel or chilled cast iron. In place of being cylindrical, they are formed on their surfaces with a number of alternate V grooves and projections of one roller working into the grooves of the opposite roller. These grooves and projections may be smooth on their outer surfaces, or they may have a series of teeth or notches formed on them with a view to the more effective reduction or disintegration of the substance under treatment. When these rollers are made in several parts, each part will consist of a disc having its periphery levelled on each side, so as to present a Λ or knife edge. By placing a number of these discs upon a square shaft, a roller of the description herein before referred to will be obtained, each disc being formed with a series of teeth or notches on its bevelled edge, or made smooth, as before described. *Patent completed.*

1410. W. H. RONALD. *Signalling and indicating the position of shots in rifle practice.* Dated May 10, 1862.

Under one modification or system of arrangement, the apparatus here employed consists of 1, 2, or other convenient number of arms, which are moveable upon an axis placed by preference below the ground. The arms are made of sufficient length to extend over the entire surface of the target, and they are fitted with sliding discs which traverse up and down the arms. At the extremities of the arms there are flags of different colours, denoting the different value of the hits; the discs are also provided with different faces, or discs of different colours and sizes. When a shot is fired at the target, and is to be signalled, the marker at the butt raises one of the arms by means of a cord passing over a pulley, so that the arm covers the spot struck by the shot. At the same time the disc is raised until it covers the part struck. The disc is allowed to remain stationary for a few seconds to enable the firing party to denote its position and record the shot. The disc is then allowed to slip down, and the arm is lowered in readiness for another shot. One of the arms carries the "danger flag," which is raised when required. In this way, during rifle practice, the shots are signalled on the exact spot hit on the target with ease, rapidity, and freedom from danger. *Patent abandoned.*

PROVISIONAL PROTECTIONS.

Dated July 18, 1862.

2056. R. A. Brooman, 166, Fleet-street, patent agent Improvements in generating heat in furnaces and fire-places. (A communication.)

Dated August 12, 1862.

2260. J. F. J. Leblond, Paris, machine maker. Improvements in sewing machines.

Dated Sept. 29, 1862.

2642. J. E. Walker, King-street, Old Ford-road, mechanist. Improvements in signalling on railways.

Dated Oct. 23, 1862.

2855. W. Clark, 53, Chancery-lane, engineer. Improvements in sewing machines. (A communication.)

Dated Oct. 25, 1862.

2871. G. and W. Luke, 98, Mott-street, Birmingham, wholesale saddlers. An improved stirrup.

Dated Oct. 27, 1862.

2886. H. C. R. Joubert, upholsterer, 18, Maddox-street. An improved method of raising and fixing at any height desired music stools, chairs, or seats,

2889. T. Pilgrim, 17, Carlisle-terrace, Fairfield-road, Bow, engineer. Improvement in locks, bolts, latches, and other fastenings.

Dated Oct. 28, 1862.

2904. C. S. Duncan, Inverness-road, Bayswater. An improved compound or material for coating or covering metallic and vegetable substances to preserve them from corrosion or decay.

Dated Oct 31, 1862.

2950. F. E. Sickles, Bute-street, Brompton, engineer. Improvements in the means of steering and manœuvring ships or boats, and in the apparatus connected therewith which apparatus is also applicable for pumping and lifting weights.

Dated Nov. 1, 1862.

2954. W. Tarr, 112, York-street, Manchester, and E. Farr, 40, Cavendish-street, Oxford-street, Manchester. An improvement in pianofortes.

2956. M. and R. Merryweather, Long-acre, fire-engine manufacturers, and E. Field, Buckingham-street, Adelphi, consulting engineer. Improvements in steam fire-engines, part of which improvements are applicable also to other purposes.

Dated Nov. 3, 1862.

2962. F. Tussaud, 105, Marylebone-road, engineer. An improved machine for cutting metal, also applicable to cutting other substances.

Dated Nov. 4, 1862.

2982. P. W. Reuter, Buckland-crescent, St. John's-wood, merchant. Improvements in dyeing. (A communication.)

Dated Nov. 5, 1862.

2993. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in commodes or water closets. (A communication.)

Dated Nov. 6, 1862.

3005. B. T. U. Monin, 60, Boulevard de Strasbourg, Paris, merchant. Improvements in breech-loading fire-arms.

Dated Nov. 7, 1862.

3009. M. A. F. Mennons, Paris. Improvements in the manufacture of paper. (A communication.)

3011. W. Clark, 53, Chancery-lane, engineer. Improvements in the means of utilizing refuse and azoted matters of commerce. (A communication.)

3013. T. Greenwood and J. Schofield, Rochdale, machine makers. Improvements in mules for spinning and doubling.

Dated Nov. 8, 1862.

3015. H. Gardner, Chapel-town, Leeds, engineer. Improvements in machinery for treating flax and other fibrous materials preparatory for manufacturing purposes, the said machinery being also applicable for pressing, rolling, grinding, pulverizing, or mixing various other substances..

3017. G. H. Ogston, Mincing-lane, consulting chemist. Improvements in treating nitrous acid and nitric oxide in order to convert them into nitric acid.

3019. W. Simpson, Liverpool, sorter. Improvements applicable to letter boxes and other like receptacles.

3020. G. L. Locke, Hampstead New-road, and J. Clark, High-street, Kentish-town, pianoforte makers. Improvements in the motive mechanism of pianofortes.

3021. E. Sonstadt, 3, Stewart-place, Alfred-street South, Nottingham. Improvements in the manufacture of the metal magnesium.

3023. J. Mellodew and T. Mellodew, Moorside Mills, Oldham, manufacturers, and C. W. Kesselmeyer, Manchester, warehouseman, Improvement in looms for weaving.

Dated Nov. 10, 1862.

3025. C. Connell, Glasgow, ship builder. Improvements in constructing ships or vessels.

3029. R. R. Holmes, British Museum. Improvements in folding chairs and seats.

3031. J. Shanks, Arbroath, machinist. Improvements in mowing machines.

3033. J. Easton, jun., and J. C. Amos, engineers, Grove, Southwark. Sawing wood.

3035. G. F. Lyster, engineer, Liverpool. Improvements in apparatus for elevating or otherwise transmitting grain and other granular substances.

Dated Nov. 11, 1862.

3037. W. Booth, J. Booth, and T. Booth, Oldham, mill-wrights. Improvements in rotary engines.

3041. F. Marriott, Miles-platting, Manchester, manufacturing chemist, and S. Holyroyd, manufacturing chemist. Improvements in the purification of gas, and in obtaining certain useful products therefrom.

Dated Nov. 12, 1862.

3043. W. and J. Galloway, Manchester, engineers. Improvements in machinery or apparatus for cutting, shaping, punching, and compressing metals.

3044. G. Smith, Phœnix Chemical Works, Cobden-street, Stewarts-lane, Battersea, practical chemist. Certain improvements in obtaining colouring matter.

3045. W. Dobson, Nottingham, lace dresser. Improvements in apparatus used in dressing lace or other fabrics.

3046. C. Socin, 2, Thavies-inn, Holborn. Improvements in looms for weaving ribbons.

3049. J. Faulding, 340, Euston-road. Improvements in locomotive engines.

3051. J. A. Duntze, Woolwich-common. Improved apparatus for communicating rotary motion to shafts or axles for various purposes. (A communication.)

Dated Nov. 13, 1862.

3054. G. W. Rendell, Newcastle-on-Tyne, civil engineer. An improved method of strengthening and hardening cannon made wholly or partially of carbonized iron or steel, or the barrels or other parts thereof.

Dated Nov. 14, 1862.

3068. W. H. Andrew, Sheffield, manufacturer. An improvement in scissors and shears.

Dated Nov. 15, 1862.

3084. F. Palmer, Northumberland-street, Strand, gentleman. Improvements in projectiles.

Dated Nov. 17, 1862.

3086. F. Rahles, Albert-street, Camden-road, professor of music. Improvements in envelopes, with the view to affording better security thereby.

3088. D. Thompson, Grosvenor-road. Improvements in screw cocks.

Dated Nov. 18, 1862.

3100. N. Thompson, 15, Abbey-gardens, St. John's-wood. Improvements in apparatus for stopping bottles, jars, and other vessels.

3102. J. Oxley, Frome, brewer's engineer. Improvements in apparatus for separating liquids from substances.

Dated Nov. 19, 1862.

3104. H. J. F. Marmet, 2, Rue Sainte Appoline, Paris. Some improvements in the construction of lamps.

3106. R. Mushet, Coleford, metallurgist. An improvement or improvements in the manufacture of cast steel.

3108. J. Arbós, Barcelona. Improvements in generating certain gases for obtaining motive power, and in the apparatus employed therein.

3110. C. Kilner, 2. Grove-cottages, Albion-grove, Islington, G. Kilner, W. Kilner, and J. Kilner, Thornhill-lees, near Dewsbury, glass manufacturers. Improvements in means or apparatus for the manufacture of glass.

3112. R. Hardman, Bolton-le-Moors, foreman. Certain improvements in looms for weaving.

Dated Nov. 20, 1860.

3116. C. Stevens, 31, Charing-cross. An improved brick-making machine. (A communication.)

3118. F. Fletcher, Birmingham, plumbers' brass founder. Improvements in the arrangement of a vessel or vessels for the compression of air as applicable to lift or force pumps.

3122. R. B. Seeley, Mortlake. Improvements in ink-stands.

3124. W, Bottomley, Bramley, Leeds, machine maker. Improvements in machinery for stiffening woollen and other fabrics.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

2056. R. A. Brooman. Generating heat. (A communication.)

2059. G. J. Yates and J. W. W. Tindall. Deodorizing paraffin.

2068. C. Ramsay. Military cloak.

2079. P. F. Cassegrain. Firearms.

2103. W. Clissold. Manufacturing cylinders.

2106. J. G. Clarke. Scythes.

2110. H. A. Jowett. Obtaining motive power.

2114. W. Clark. Decanting wine. (A communication.)

2117. V. Manzini. Locomotive engines.

2124. J. H. Selwyn. Paying out and raising electric telegraph cables.

2133. T. A. Favrichon. Baking ovens.

2140. H. Hedgley. Lamps.

2141. E. Burnett. Cart and sleigh.

2143. C. W. Siemens. Gas engines.

2144. R. Thompson. Sewing machines.

2155. M. Henry. Obtaining fibrous materials. (A communication.)

2160. B. Bailey. Cutting chaff and other vegetable matters.

2180. G. Haseltine. Drying grain, gunpowder, and other granular substances. (A communication.)

2199. W. Clark. Purification of water. (A communication.)

2332. J. J. H. Gebhardt. Fastening for purses. (A communication.)

2242. W. Clark. Carriage for conveying sugar moulds in sugar refineries. (A communication.)

2283. G. Welch. Inkstands, metallic pens, and pen-holders.

2531. J. Pender. Hoops for fastening bales.

2768. D. and C. J. Reid. Manufacture of cases for watches.

2861. J. Field. Steam engines, condensers, and boilers.

2938. H. L. Corlett. Construction of tuyeres.

2950. F. E. Sickels. Steering and manœuvring ships or boats.

2956. M. Merryweather, R. M. Merryweather, and E. Field. Steam fire engines.

2961. J. Winter. Tap or cock.

2971. D. Scattergood. Circular frames for the manufacture of looped fabrics.

3035. G. F. Lyster. Elevating or transmitting grain.

3046. C. Socin. Looms for weaving ribbons.

* 3052. A. Graemiger. Looms.

3060. R. and P. Sykes. Fibrous materials.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'

LIST OF SEALED PATENTS.

Sealed November 28, 1862.

1625. P. U. Payras.	1684. G. B. Toselli.
1648. T. T. Lawden.	1688. E. Scheutz.
1657. A. J. Sax.	1692. G. Rydill.
1661. J. Key and F. Potts.	1719. J. M. R. Cattean.
1673. J. Biers.	1723. A. Knowles.
1674. S. Weston.	1732. J. B. Ingle.
1675. J. L. Norton.	2020. S. Partridge.
1676. J. Fincham.	2043. M. Kurts.
1677. A. H. Perry.	2078. S. and J. Lord.
1680. W. James.	2395. H. Jones.
1683. G. Allibon and E. Snell.	2656. G. Haseltine.

Sealed December 2, 1862.

1681. T. Alcock.	1786. A. Crestadoro.
1694. J. Bell.	1794. W. Clark.
1696. J. M. Stanley and J. Stanley.	1796. J. Kellow and H. Short.
1703. W. E. Newton.	1806. A. Howat.
1707. W. R. Jeune.	1875. T. R. Tebbutt.
1710. A. J. Adams.	2186. W. E. Newton.
1711. G. D. Hatton.	2628. J. Milner, R. D. Milner, and F. Hurd.
1713. C. Hook.	2677. T. Greenwood.
1718. J. Keeling.	2717. T. Ratcliffe.
1748. F. Tolhausen.	
1776. R. Hicks.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2673. G. E. Donisthorpe.	2713. G. J. Firmin.
2676. L. J. Vandecasteele.	2859. D. J. Fleetwood.
2677. C. Bedells.	2694. R. A. Brooman.
2706. B. Samuelson and W. Manwaring.	2720. J. Cocks.
	2723. J. Paton.

PATENT ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2705. E. J. Davis.

LIST OF SPECIFICATIONS PUBLISHED

For the Week ending December 5, 1862.

No.	Pr. s. d.	No.	Pr. s. d.	No.	Pr. s. d.	No.	Pr. s. d.	No.	Pr. s. d.	No.	Pr. s. d.
751	53 0	1152	0 10	1170	0 4	1188	0 4	1206	0 4	1223	0 8
1135	0 8	1153	0 6	1171	0 4	1189	0 6	1207	0 6	1224	0 8
1136	0 8	1154	0 4	1172	0 4	1190	1 4	1208	0 8	1225	0 4
1137	0 4	1155	0 4	1173	0 8	1191	0 6	1209	0 4	1226	0 4
1138	1 8	1156	0 4	1174	0 10	1193	0 4	1210	0 10	1227	0 4
1139	0 4	1157	0 4	1175	0 4	1194	0 8	1211	0 10	1228	3 4
1140	0 4	1158	0 4	1176	0 6	1195	0 4	1212	0 8	1229	0 6
1141	0 6	1159	0 4	1177	0 8	1196	0 8	1213	0 4	1230	0 6
1142	1 0	1160	0 4	1178	0 4	1197	0 4	1214	2 10	1231	0 6
1143	0 4	1161	0 6	1179	0 8	1198	0 4	1215	1 4	1232	0 4
1144	0 4	1162	0 10	1180	0 4	1199	1 0	1216	0 6	1233	0 10
1145	0 8	1163	0 4	1181	0 4	1200	0 4	1217	0 4	1234	0 4
1146	0 4	1164	0 10	1182	0 6	1201	0 8	1218	0 10	1235	0 4
1147	0 8	1165	0 10	1183	0 4	1202	0 4	1219	0 4	1236	0 4
1148	1 6	1166	0 10	1184	0 4	1203	0 4	1220	0 10	1237	0 4
1149	0 4	1167	0 4	1185	0 10	1204	0 10	1221	0 10	1238	0 10
1150	0 8	1168	1 8	1186	0 8	1205	0 4	1222	0 8	1239	0 4
1151	0 6	1169	0 4	1187	0 4						

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, DECEMBER 12, 1862.

THE SMITHFIELD CLUB SHOW.

THERE are not many novelties in the agricultural engineering line in this exhibition. Indeed, many of the "exhibits" have been transported direct from Kensington to Islington. The greatest novelty of the show consists in the building itself—a great improvement on the old Baker-street Bazaar. The available space in the Islington Agricultural Hall is no less than three times greater than at the former place. The spaciousness of the structure even produces the illusion that there are fewer exhibits of cattle and implements than there used to be in the Baker-street building. The company that has leased the hall to the Smithfield Club limited the cost to £25,000. The architect is Mr. F. Peck, of Maidstone; the contractors, Messrs. Hill, Keddell, and Co., of Whitechapel. These latter gentlemen agreed to execute the work for £24,980, the highest tender sent in being £26,600. The façade of the hall is in the Italian style, variegated with coloured bricks. The arrangement of these latter seem to us to be rather questionable, giving a striped "zebra" kind of look to the structure. The front, next Liverpool-road, shows two lofty towers for ventilating purposes, and also a central entrance, near which are different offices for the use of salesmen, police, telegraph and post offices, &c. The other front, next Upper-street, has a central archway, and a shop on on each side, and shops are intended to be constructed up to the great hall, and to cover the entrance up with an iron and glass roof. The main hall is 384 ft. long, and 217 ft. wide. This is covered with a central segmental roof of 145 ft. span, and 76 ft. extreme height. The two other side roofs are of 36 ft. span, and are re-turned at the ends; they cover the galleries for the reception of implements below, two tons and upwards in weight. Adjoining the Cattle Show is the minor hall, for the show of pigs. It measures 100 ft. by 100 ft., and is covered with roofing similar to that over the side galleries. The iron pillars are hollow, forming drain pipes from the roof to gutters underneath. There are five sets of double staircases, 10 ft. wide, leading up to the galleries. There is a reservoir above, containing 50,000 gallons of water, with hydrants to different parts of the building. There are three lines of stands on the galleries, one being against the wall, the other two being placed back to back down the middle. There are thus two clear lanes for the visitors, and a view of almost the entire hall can be seen from the balconies. The ventilating towers did not seem to us, on Tuesday evening, to quite fulfil their function, as it certainly felt rather close and hot in the galleries. The lighting up seems also rather deficient, although it is said that the number of gas-burners has been increased to 4,000, the number being 1,000 in the original estimate.

As to the living exhibits, shown in this, on the whole, very satisfactory structure, we must leave them to the consideration of other and better judges than ourselves. After being transformed into beef, mutton, and pork, we might, perhaps, hazard an opinion. We have certainly heard of pigs in connection with steam-boilers. The Yankees sometimes tell a story of pigs being thrown into the boiler furnace during the excitement of a Missisippi steam-boat race. We do not think that English pigs would run this risk.

"Like any other Englishman," we also imagine ourselves to be a judge of horse-flesh, but there were no cattle of this description entered by the Smithfield Club. Mr. Richard Roberts, the "Admirable Crichton of Mechanical Engineering," was accustomed to tell his pupils at the Atlas Works in Manchester, that the finest lines in Nature were those to be seen in a thorough-bred horse. This gentleman, in the varied machines he turned out while in practice as a mechanical engineer, was not satisfied with inventing the mechanical arrangements. He also strove to make every machine a work of fine art, by the elegant shapes and curves he gave to the main parts. Beauty and efficiency seem always to go hand in hand together, and the result is that he and his pupils have turned out some of the handsomest and best machines ever made in a workshop. There is a field also in this direction for implement makers.

As a result of the minute comparisons afforded by the long stay of the implements in the International Exhibition, we are inclined to believe that several improved plans, patented and otherwise, are getting into more general introduction.

It is a trite remark, that if the different patented plans could be combined into one machine, the general result would be greater excellence. This, we venture to say, would be more especially the case with the thrashing machine, avowedly in its present stage a very complicated and incomplete apparatus. One little fashion, we may notice, consists in the extended adoption of a grey drab-coloured paint for the portable engines. This tint harmonizes very well with the bright iron work. The exquisite locomotive engine of Beyer, Peacock, and Co., in the western annex, and the stationary engine of Ransomes and Sons, in the eastern annex, were painted in this manner. We understand that the Americans are using this grey tint for their war-steamers, as it makes a vessel less visible, and a more difficult mark for shot. Most, if not all, of these inventions have been described in former numbers, so we need not, while alluding to them, enter so much into details as we otherwise should do. If any manufacturer should take exception to the following remarks—remarks made in no unfriendly spirit—our columns are open to any communications he may wish to make in refutation of our assertions.

Taking a walk on the ground floor, below the galleries, catalogue in hand, we find that Messrs. TUXFORD & SONS, of Boston, are first on the list. They send three portable engines, and an old-fashioned looking stationary engine, the latter not being in the catalogue. One of the portable engines is a "10-horse power portable steeple engine," the cylinder being vertical, and with that peculiar old-fashioned not-at-all-to-be-admired arrangement of working parts denominated "steeple." We find it pompously stated in their trade circular that "the portable steam engine, with vertical cylinder, has clearly established the fact, so long maintained by Tuxford and Sons, that the upright position of cylinder is the true position for maintaining the power of the engine, and for producing in all respects the greatest amount of effectiveness with the least amount of wear and tear. These views have been supported by the Consulting Engineer of the Royal Agricultural Society." If Mr. Tuxford and Mr. Amos are right in this question, all the rest of the world are wrong. As was well noticed by Mr. Fairbairn, at the meeting of the British Association at Cambridge, and by Professor Rankine in his report on the Machinery in the Exhibition, the general tendency in all countries is towards the horizontal cylinder. Leaving locomotives, with their two horizontal cylinders, out of the question, we will venture to say that there are more horizontal cylinders in successful operation than cylinders in any other position. The antiquated bugbear of the weight of the piston wearing out a horizontal cylinder, has been disproved by the experience of the last thirty years. If an advantage is claimed for this engine on the score of its being boxed up from dust and dirt, we should say that the advantage is a very futile one. For one thing, it cannot be seen while at work. Besides, if covering up be so necessary, this can be done very easily with a horizontal engine. Mr. Tuxford does show two horizontal portable engines, so that he has made some concession to the prejudices of the multitude. If they have been made to order only, we should say that the customers have better taste than the maker.

SMITH, BROTHERS, of Thrapstone, send, amongst other things, a traction engine, which is on springs, a haymaker, and a chaff-cutter. The haymaker has the tines set on a cylinder in such a way that they cannot turn up more than a fixed size of swathe. The feed-rollers of the chaff-cutter have merely globular prominences, or round knobs, cast on them. These knobs appear of doubtful efficiency for bringing the hay up to the knives.

Messrs. GARRETT and SONS send an improved edition of the double-cylinder engine they had in the Eastern annex of the Exhibition. Their thrashing machines are distinguished by three blasts used in dressing grain, being taken from a single powerful fan placed outside the drum spindle. They have also some steam ploughing tackle, manufactured at their works, upon Messrs. Howard's principle. We wonder whether they will improve this tackle to the same extent that Messrs. Howard improved upon Mr. Smith's, of Woolston? Messrs. Howard seem to have improved Mr. Smith's invention off "the face of creation," as the Yankees say. The exhaust pipes on their engines seem rather diminutive. We believe that there is also a firm of this name near Magdeburg, in Prussia.

FERRABEE and Co. send some engines among other exhibits. The cutters on the connecting rod end of these engines are adjusted in the same way as the jaw of their universal spanner. The double cranks of these engines seem too far from a proper bearing.

HORNSBY and SON's thrashers are of rather novel make. The straw shaker and vibrating board cranks are made in parts, that the bearings may be renewed when worn. We believe that the drum has Wallis and Haslam's patent spherical bearings. There is only one belt used. Their improved corn elevator consists of a kind of Jacob's ladder, but instead of the cups, plain plates are fixed on the belt. It also (we presume from its high speed) acts as a barley awner and chob cleaner. This apparatus is probably one of the results of the impulse given to improvements in thrashing machines by that remarkable invention, or rather discovery, the Bruckshaw and Underhill Elevator. We doubt, however, whether it will act so well as the latter contrivance. The turnip-cutters and the root-pulpers exhibited by Hornsby and Son form, we believe, a new line of trade for this firm, and are shown for the first time. Both the turnip-cutter and the root-pulper are made out of a revolving disc, as in some other similar machines. The turnip-cutter has angle knives (known as Gardner's) fixed on a curved bar, so that the knives cut into the root one after

another. There is a flange on the disc, the function of which is to return the "last piece" to the feeding hopper, to get properly cut. The pulpers have single diamond-pointed knives of steel, all fixed with wooden wedges. The machines are fitted with an oscillating bar, having teeth, through which the cutters pass, and worked to and fro by a 3-16 throw eccentric, which is placed on the main spindle. This arrangement is to prevent the escape of the last piece and to clear the cutters. The crank shaft brackets of the portable engines are cast in the shape of two "classical" (!) columns, which arrangement, we suppose, is considered "high art" at Grantham.

Messrs. Tasker and Son, who style themselves "general engineers," send, besides other implements, a thrashing machine fitted with Underhill's elevator.

Mr. Foster, of Lincoln, sends an 8-horse engine and a thrashing machine. We took the engine, at first sight, to be one from the Stamp End Works. It deserves great praise for exactitude, as it is a correct copy of the Clayton and Shuttleworth engine. "Imitation is the best flattery," and no doubt Mr. Shuttleworth feels highly honoured at his plans being so carefully followed. The exhaust pipe is taken back through the boiler, as in the Stamp End products, but it has not the strong hollow castings for crank-shaft brakets, which distinguish the latter. The thrashing-machine has a chob-cleaner, placed so as to lift up the grain from the chob-spout to the Jacob's ladder elevator, which latter is thereby somewhat shortened.

Burgess and Key send M'Cormick's sheaf delivery reaper, the very same highly-ornamented article shewn in the American Department of the International Exhibition. They also show several chaff-cutters, very similar to the well-known ones of Richmond and Chandler.

Mr. John Fowler exhibits his large steam ploughing tackle, in the shape of a large engine and four-furrow balance plough, and ditto cultivator. We hoped to have seen Mr. Fowler's new plan, with slack gear, for using an ordinary portable engine in a direct acting way. We suppose that the sale of a large tackle would pay better. We consider that Mr. Fowler is a public benefactor, from the amount of money and brains he has invested in steam ploughing. He has our hearty wishes for his continued prosperty.

Messrs. A. and E. Crosskell show the Victoria reaping machine amongst their exhibits, the same machine introduced into this country by Messrs. Ransomes and Sims.

Brown and Co., Cannon-street, show a compact little specimen of a one-horse engine, some lawn-mowers, hurdles, iron gates, &c.

Clayton, Shuttleworth, and Co. send a number of their well-known engines and thrashers, We alluded at some length to the former exhibits in our last week's number. We expected to see some of these portable engines with the fire-box flush with the boiler-barrel, but are disappointed. Their traction engine is an improved edition of the remarkable specimen of mechanical engineering they sent to the Great Exhibition. The reversing gear does not consist, at present, of a screw with a *slow* pitch (!), but of a reversing handle and link, both of which are absurdly cranked and twisted. Their thrashing machines have, of course, Underhill's elevator. They have also, for a number of years, been the users of Goucher's patent beater. A report as to the results of Mr. Goucher's application for a prolongation of his patent will be found further on in our columns. Considering that all the patented beaters out are evasions, more or less, direct of Mr. Goucher's patent, he has fully deserved to have his patent prolonged. We believe that, naturally enough, Messrs. Clayton and Shuttleworth opposed the application.

W. S. Underhill shows a thrashing machine with his patent elevator. This, as is well known, consists simply of an ordinary fan, revolving at about 500 revolutions per minute, and into which is fed the grain to be elevated. It throws up the grain through the blast, the centrifugal force, and percussive action of the blades, combined. It also chobs wheat and awns barley at the same time. It is a remarkable invention; and is, no doubt, in its further developments, destined to form an era in the improvement of the thrashing machine.

Messrs. Howard show their well known horse ploughs and steam ploughing tackle. In the latter, as is well known, they devote themselves exclusively to the use of the ordinary portable engine.

Messrs. Nalder and Nalder show several of their well known screens, and a complete thrashing machine, the latter at a very low price. The screens are made of very thin cast-steel wire, whereby greater screening surface is secured to a given size. The wires are fixed into slits in the longitudinal bars of the screen, the bar being rivetted back into the wire. The finer wire, probably, does not adhere so tenaciously to the grooves as wire of a thicker kind would. All the reciprocating parts of the thaashing machine are suspended on elastic joints, on Coulson's principle; they consist of ash springs. This excellent plan seems to be getting into extensive use. Clayton and Shuttleworth are also adopting spring hangers.

Aveling and Porter send two of their excellent agricultural traction engines.

Coleman and Sons exhibit a traction engine made by Messrs. Clayton and Shuttleworth. We believe that this is the famous engine that would not come in at the gateway. A couple of timber uprights had to be removed before it could pass inside.

Holmes and Sons, of Norwich, show their thrashing machine, which is made so as to sack the chaff. The whole machine is made very low from the ground, and is thus rather convenient.

Ransomes and Sims send that great variety of articles which make this firm quite a "universal genius" in manufacturing. We alluded last week more particularly to their engines. Their thrashing machine is very well arranged, and the details about it are very good; indeed, we should be inclined to give it the preference over almost any other in the Show, although we believe that it costs £10 more than any other. The beater drum is a modification of Goucher's, the beaters being made of three-sided wrought iron rods, twisted while hot into the form of a screw. It must be rather heavier than its prototype, but that is by some considered an advantage. The shakers are peculiar, being those known under the name of Brinsmead's rotary shakers. It consists of a series of revolving rollers, each armed with three rows of spikes. The spikes nearly touch the circumference of the adjacent rollers, and also the *fixed* board forming the bottom of the straw shaker. The straw is thus shaken forward, while the cavings are urged back towards the riddle. The screen used in their finishing machine is an admirably ingenious apparatus, the construction of which, however, cannot be made plain without a drawing. It can be adjusted to any size of grain. We will shortly describe it in one of our numbers. They also send a harrow, the teeth of which are fixed in a novel manner. We hope to be able to illustrate this arrangement next week.

W. C. Cambridge sends his well-known chain harrows and clod crushers.

C. E. and F. Turner exhibit some engines, &c., which we believe also figured in the Exhibition. The piston-rod of one of these engines seemed very weak. Perhaps it is of steel.

Woods and Cocksedge show what they call a chaff-sifter. It consists of a neat arrangement for giving motion to a large sieve. It does not appear in the official catalogue.

Mr. Collinson Hall exhibits, close by, a steel-link chain, working on a seven-sided drum, as a substitute for a wire rope. If there were no such a thing as steel wire rope, this would probably be an improvement.

Ashby and Co. have sent their rotating harrows, an American invention, we believe, which we have also described in a previous volume. Their beater is another modification of Mr. Goucher's.

Brown and May make an appearance with their portable engines. They are properly balanced by a counterweight being cast into the rim of the fly-wheel. The counterweight might, however, have been made more shapely. There is a deflector for coal-burning placed on the fire-box door of the 8-horse power portable engine. Near this stand is a working model of a pump, with very ingenious valves, invented by Mr. Holman. We hope to be shortly enabled to give a description of this.

Barrett, Exall, and Andrewes, send their rather slimly-proportioned engines. They have made the fire-boxes of their portable engines flush with the boiler barrel, and are thus in advance of most other makers. We like the general arrangement and the details of these engines. Their thrashing machines have Underhill's elevator, Coulson's spring hangers, and Wallis and Haslam's spherical bearings for the beater drum.

Ruston, Proctor, and Co., send another younger brother of the Stamp End shape of portable engine. The exhaust pipe is carefully taken through the boiler.—Humphries, of Pershore, have an old-fashioned style of thrashing machine in the Show.—Robey and Co. exhibit their 10-horse traction engine. It is on springs, which is an improvement.—Davy, Brothers, Sheffield, have arranged the eccentric rod of their engine on a skew, with the centre line of same.

Allchin and Son exhibit engines with not very commendable details. They use superheated steam. It is passed through pipes in the smoke box.—Marshall, Sons, and Co. "limited" show another engine of the Lincoln "Stamp." Is it the scheming that is "limited" in this firm?—J. and F. Hancock make an appearance with a number of their pulverizer ploughs and butter machines. The pulverizing plough seems to us to be a very clever idea. It is a pity that the detail and the workmanship is not of a better quality. In the hands of a Howard, a Hornsby, or a Ransome, it would be a very different tool. We hope next week to be enabled to resume our notice of the exhibits in the gallery of this temple of agriculture.

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HOW TO IMPROVE THE QUALITY OF CAST AND WROUGHT IRON.

We lately felt constrained to speak in terms of unqualified praise of the new edition of "Truran's Iron Manufactures of Great Britain." A more minute analysis of the work has served only to fortify us in our first position in regard to it. It is replete with practical and reliable information on the sub-

ject of which it treats, and is worthy a place in the library or on the office-table of every mechanical man in or out of Great Britain. Perhaps there is no consideration of more real importance to the founder, the engineer, and the general mechanist than the means of improving the quality of iron. It is a point upon which it is not possible to lay too much stress, and it is very properly made a prominent feature of in Truran. Many modes of improving the quality of bar iron, by the addition of various metals or oxides at one or other of the stages of its manufacture, have been devised. In all propositions, however, for the improvement of malleable iron, by the incorporation therewith of foreign ingredients, it should be borne in mind that while it is possible to improve thereby a single characteristic, the inevitable result is to lower the general quality of the iron so treated. In seeking to improve the general quality, it should be distinctly understood that a *bonâ fide* improvement can only follow the abstraction of an injurious alloy, the substitution of a less for a more injurious mixture, or from the addition of a metal superior to that of the iron under treatment. Under no circumstances whatever can the mere addition of substances, or metal of superior qualities, improve the general qualities of iron. These are heightened and developed by every degree of refinement, but inevitably debased by every adulteration. The list of substances capable of being mingled or alloyed with iron is large, but their employment as a means of improving the general quality is invariably attended with contrary effects. The presence of carbon, by lowering the temperature of fusion, increases the fluidity of cast metal; but the qualities of hardness and tenacity are reduced in nearly the same ratio. Silicon in quantity seems to impart additional hardness, but induces a deficiency of tenacity, and materially impairs the ability of the metal to withstand crushing and abrading forces.

The tenacity of cast-iron of a low specific gravity, and consequent inferior quality, may be improved by remelting and incorporating in it wrought-iron scraps of a superior tenacity. But the improvement in quality by this treatment nearly disappears when the cast-iron is of a high specific gravity. Any improvement occurring to irons of low quality, debased by the presence of an excess of carbon, is due mainly to the increase of density and greater purity which follows the partial oxidisation of the volume of carbon during the operation.

The superior strength of air-furnace castings is generally admitted by ironfounders, but the common explanation of that superior strength, of its being due to a greater degree of homogeneity, arising from the remelting of the crude iron, is, we think, altogether erroneous. The simple operation of remelting increases the density and tenacity of crude irons of grey quality in proportion as they are charged with carbon. Further remeltings develop those chatacteristics until the iron has attained a high degree of refinement, and increased its tensile strength hy one half. With white irons from blast furnaces, consuming a minimum quantity of fuel, the improvement is not so marked; and this arises from the fact that they contain a smaller amount of carbon, with a greater quantity of metalloids more difficult of oxydation. The remelting in this case is, therefore, attended by a larger waste of metal in proportion to the volume of impurity removed.

While maximum tenacity is attained only by remelting and mechanical subsidation, the operation results in a corresponding loss of fluidity, and the iron so treated is not adapted for small castings, or the filling of sharp angles or mouldings in larger. Iron undoubtedly possesses the greatest density and tenacity when pure, and the presence of any other metal or matter in mixture or alloy reduces its density, and diminishes in a more rapid ratio its tensile strength. Specific gravity and quality are, to our thinking, nearly allied in the character of irons, and weight is one of the best tests of quality. We shall return to this subject anon.

CHATHAM DOCKYARD.

The cost of these works for land defences are estimated at £1,350,000. They would mount 335 guns, and would require barrack accommodation for 3,550 men.

The "transformation of the navy," to use the euphemistic term in vogue for the substitution of iron for wood in the construction of men-of-war, has effected a radical change in the economy of Chatham Dockyard. The state of transition in which everything appears, the results of tantalizing essays that are to be met with here and there, show how great has been the change, and how laboriously it has been effected. Six timber ships are on the slips—the "Salamis," the "Myrmidon," the "Rundere," the "Belvidere," the "Berlinda," and the "Menia." On some there are perhaps half-a-dozen shipwrights at work on each; on the others none, and they are left to the care of a ship. Two covered slips of the most recent construction, by Gressel and Co., in 1856, are unoccupied, and from one of them, the "Royal Oak," now plating with armour in No. 3 dock, was lately launched. The timber-floating basin looks desolate, the mast houses abandoned, and the whole activity of the yard appears concentrated on the two armoured ships which are in the process of construction, and in the shops where their component parts and plates are being shaped and fitted.

Entering the yard we pass storehouses and workshops that give out no signs of life under the change, and the slips where a despatch vessel and other small craft are standing. Next is No. 1 dock, built for the reception of small vessels, but which has been covered on a level with the soil, and roofed over to serve as a fitting shop for the "Achilles" iron ship, which is building in the dock No. 2 alongside. It is here that the frame of the ship is prepared and fitted in parts before being built up. The frames, which answers to the ribs of timber ships, are composed of bars of angle iron, from ⅝ to 11-16ths of an inch thick, riveted together and bent into the desired shape. For this purpose a modern mould is made to each frame—that is to say, thin boards are sawn out to represent in their convexity the sectional lines of the ship. On the floor of the shop is the "levelling plate." It consists of massive iron blocks, pierced with numerous holes disposed quincancially, and solidly bound together to form a levelling plate of sufficient thickness. Opposite and close to one end is a pair of hot-air furnaces for heating the angle iron. They both communicate by flues with one chimney, and other arrangements are adopted to ensure an economy of fuel, as well as the uniform and quick heating of the bars of angle iron. The furnace itself is at the end opposite the door, and in one case there was a furnace in either of the longitudinal sides. The heat and products of combustion pass from the furnace over the brick bed on which the bars are placed, and escape by a return flue to the chimney. The brick roof being arched, throws down the heat upon the iron. When the bar has been raised to the requisite temperature it is withdrawn, and laid on the levelling plate, whereon the sectional line or form of the set has been previously marked by pins inserted in the holes of the levelling plate. Then with hammers, tongs, and hand-spikes, the bar is rapidly bent to the required form. The turning up of the portion resting on the plate is remedied by flat-headed punches, fastened to long withy handles, held by workmen, while others strike the punches on the head with huge sledge hammers until that portion of the bar is levelled. It cannot fail to strike the spectator that this mode of carving the frames is unnecessarily tedious, costly, and requires a degree of human labour unsuited to the inventive genius of the age—so fertile in contriving labour-saving machines. There can surely be no difficulty in devising a machine which would roll the bar to the sectional line in one operation, and in no more time than it takes to write this sentence. If a pair of rollers—one vertical to bear upon the portion of the bar resting on the levelling plate, and the other horizontal, to bear upon the upright portion behind, which are the pins—were placed in connection with a mechanical arrangement which would make them follow varying curves—an arrangement, in fact, something of the character of a pentagraph—then the operation would be simplified, and more expeditiously performed than now, when a dozen or fifteen men are required to bend a bar by dint of sledge-hammering, for then all that would be required would be a sufficient number of hands to draw the bar from the hot-air furnace by an overhead traveller, and to arrange the pins according to the curve, while one man at the other end of what, for lack of better name, must be called a pentagraph, would suffice to cause the rollers to travel in the curve of the sectional line, as will be easily understood. It matters not whether this or any other mode be adopted of rolling the bars of angle iron into any curve that be required; the essential point is to introduce machinery to shape the frames so that they may be more accurate, take less time in their production, and cost less money.

Each frame or rib is composed of two or more bars of angle iron, held together by "holler riveting," so as to support for the iron skin, teak-backing, and armour plates on the outside, and supports for the planking inside. The frames for the stem and stern are more complicated, and composed of a greater number of bars, but this system of construction is the same; the rivet holes in the frames are punched out by the ordinary machinery, and the rivets are hand-fastened while cold, and this, although Fairbairn claims for machine-riveting a superiority of from 4 to 5 over hand-riveting. When finished so far, the frames corresponding are temporarily fitted together, and the parts carefully adjusted; after which they are placed in the positions they are permanently to occupy—the ship being built in sections. The beams are of iron rolled into the shape of double flanged girders. The combination of angle iron undoubtedly gives frames of great strength, but still, to the eye, a thickness of ⅝ of an inch appears slight when we remember the enormous weight they have to bear of armour plates, teak backing, skin, and outside planking. True, the frames are very close, and so would compensate for their apparent slightness.

The next point of novelty and interest is the preparation of the armour plates and their fixing to the ship's sides. They are manufactured by the Thames Ship-building Company, and are said to be superior to all others in quality, homogenity, and toughness, that have been sent in from the great centres of iron manufacture. If so, and there appears no reason to doubt the statement, the fact is noteworthy, as showing how good workmanship will overcome the disadvantages of increased cost of labour, raw materials, and fuel. As compared with northern iron manufactures, the Thames Company pays double the price for fuel, a fifth more for wages, high rent, and the carriage on raw material; while from the north the carriage is paid on the manufactured product. To judge from their working, the plates are of an unusually excellent quality. Their weight averages 3½ tons, including the large ones for the broadsides, and the smaller ones for the bows and quarters. The thickness of the first is 4½ in., while the second, which present oblique surfaces to shot, are less.

The first step to putting on the ship's armour, above the iron skirt, bolted to the frames by hot rivets, and a teak backing, 8 in. thick, overlaying the skin, is to take a mould of the curved surface of that portion of the ship's side to which the armour plate is to be adapted. These moulds

are taken in thin planks for the horizontal and vertical curves—that is to say, for the curves to be given to long and short sides of the plate. A number of wrought-iron bars, longer than the width of the plate, of about 5 in. thick, and 3 in. broad, are bent to the vertical curves of the ship's side, which the plate is to assume, in order that it may fit closely to that portion which it is intended to protect. In front of a hot-air furnace is the bending cradle, which now first devised for shape the armour plates of the floating batteries constructed for the attack of Russian maritime fortresses during the late war. The cradle consists of two vertical and parallel open frames—pierced with numerous holes in the upper half—each of the length of the plate, and set apart a distance equal to the width of the plate. The open frames consist of a number of wrouht-iron slabs, somewhat more than 3 ft. high, 8 in. wide, and 1 in. thick. The space between each two is equal to that of the shaping bars. The slabs have a double flange at bottom, by which they are securely bolted, in a vertical position to the bed plate, and a flange on the inside at top, to which a longitudinal slab is bolted throughout the entire length, to give increased rigidity to the frames, and at the same time to serve as *point-d'appui*, against which wedges are driven to force the armour plate down. At about the centre is another longitudinal slab, on which the ends of the shaping bars rest, and which is capable of adjustment, to give the required curve to one side of the plate. The longitudinal slabs, and cross or shaping bars, being arranged according to the mould taken from the side of the ship the armour plate is to cover, the latter is withdrawn red-hot from the hot-air furnace, opposite and close to one end of the cradle, and laid upon the shaping bars. Immediately other bars are introduced above the plate, but below the longitudinal slabs, and with their ends passing beyond the spaces between each two of the vertical slabs. Wedges are next driven in between the tops of the upper bars and the bottom of the longitudinal slabs, until the armour plate is bent down to the curve required. The driving in of the wedges is tedious and laborious in the extreme. On either side of the cradle are iron rammers, weighing each about 600 cwt. They are balanced and suspended from the centre by chains attached at top to rings, which are free to travel along horizontal iron rods over head. The rammers are worked by men horizontally in pairs, and against the wedges over the ends of the same bar simultaneously, so that the plate may be forced down gradually. Were all the rammers worked at the same time, as they should be, and with a minimum of four men to each, it would require twenty-four men to bend a plate in one heating. If this be persisted in, which we do not think likely, there is no reason why the wedges should not be driven in by moveable steam hammers, working in a horizontal plane.

The inventive facilities of our engineers are surely equal to devising some mechanical means to bend the armour plates, whereby human intelligence will be all that will be required to direct the force of steam. Whether it be by steam hammers travelling over the armour plate laid in a compound bed plate, capable of being adjusted to the required curve, only adjustable rollers passing over the surface of the plate, in manner similar to the one above, or by a series of hydraulic presses with adjustable surfaces, that the problem will be solved, we know not, but we feel confident that it will be solved, and are strengthened in this belief by the fact, that an invention made at Plymouth for effecting this object, by a series of hydraulic presses, and that an officer of the Admiralty has been despatched to examine and report upon it. However, the system of shaping cradles, which was employed to bend the plates of the "Warrior" and "Resistance," admits of the plates being bent to within ¼-inch of the required curve. Since the "Warrior" was plated, further advance has been made to accuracy, and the plates are now curved to fit quite close to the ship's side. For this purpose the plate, after it has been in the shaping cradle, is removed to a hydraulic press of peculiar construction, made by Messrs. Westwood, Baillie, and Co., and capable of increasing a pressure to 2,000 tons. The bed plate, so to speak, is carried above the piston by two pairs of stout cylindrical standards, having screws cut on the upper parts and fitted with nuts to admit of the bed plate being adjusted to any required height. The armour plate (cold) is carried in slings when not resting on stout wooden rollers; two on either side of the press, whereby it is shifted to and fro between tha bed plate and piston. The workman is provided with moulds exhibiting the curves to which the plate is brought. Then, by blocks and sheet iron of various thicknesses, which he places between the armour plate and bed plate, he blocks up the first to the required curve, using the portion of the hydraulic press to bulge out the plate, as it were. After this the plate is carried to a horizontal planing machine, where the longitudinal sides are placed to obtuse angles, one entering and the other projecting, so that the plates may fit accurately to one another and hold fast together. The "Warrior's" were, we believe, tongued and grooved, and plates of this form may be seen in the yard; but the arrangement of angulated edges is undoubtedly the best. The ends of the plate are planed straight in vertical planing machines, and particular holes on two ranks are drilled in the plate if it be of the largest size. Instead of being cylindrical, the holes are conical, or diminishing in diameter from the outside to the inside, so that a considerable amount of the strain is transferred from the heads of the bolts, which are countersunk, to the whole of that likewise conical which holds in the thicknes of the plate. Then the plate is carried on a horse to the side of the ship, where it is lifted by a pontoon steam crane, which travels fore and aft on a tramway alongside the deck, each on one side. In this position the inside of the plate is daubed over with red paint, and then lowered on to spars or inclined guides, down which it slides, and is applied to the part it is to protect. Afterwards it is removed to ascertain from the marks left by the red paint if it fits accurately. If it does not—and it very rarely fits the first time—the plate is carried back to the hydraulic press to be operated on again and again until the exact curve is attained. When this is done, the plates up to the walls are coated on the inside with tar, and fixed to the ship's sides with tarred felt. Above the walls, dry felt is used, and the plates are not tarred. The bolts which hold the plate are 1½ in. in diameter, and look too slight to hold so great a weight as they will have to do in a rolling sea. But when it is remembered that Mr. Edwin Clarke deduced, from experiments made in connection with the Britannia-bridge, that it would require 24 tons to shear a rivet of 1 square inch sectional, it will be seen that the bolts which have a sectional area are nearly double; 1·76 in. are ample. Mr. Fairbairn gives something less; but taking the very minimum, there can be no fear of the plates shearing or dragging the bolts unless the elasticity of the timber back should, in the course of time, allow of too much play. The bolts are provided with screws on the inside, and nuts, so that the plates could be tightened. Nevertheless, the system of fastening receptacles is the weakest point in the whole method of construction. Both the "Achilles" and "Royal Oak"—the iron and timber ships—are plated in the same manner, and certainly nothing can surpass the workmanship. The plates are close home, and fit to one another with the greatest accuracy. They require no caulking or cement to hide the seams, like the "Warrior's." Plated from stem to stern, these new ironsides are a great improvement on the "Warrior," and their sides as smooth and sightly looking as any timber ship, with the exception of the sterns. The stern of the "Achilles" is not yet up, but that of the "Royal Oak" is as ugly as it is possible to imagine. It resembles nothing so much as the stern of a dummy at any of the landing piers on the river. It doubtless has its use, though it must prevent fire from the main deck in the same vertical plane as the keel—a faculty not to be despised in a stern chase. What makes the workmanship of the plating so noteworthy is that it has been executed by shipwrights. Some time back the engineers, to the number of 90, struck work. They were allowed to go, and their place supplied by shipwrights, who were doubtless glad of the chance, for they saw their trade threatened with extinction, consequently they took to their new trade with a will. In a couple of days they could drive rivets as fast and as well as a regular boiler-maker, and they may be now seen sledge-hammering, punching, drilling, planing, and shaping iron, as if they had never done anything else all their lives. The lesson is a useful one, both for men and employers. It shows that among intelligent workmen the division of labour need not preclude the attainment of proficiency in several branches of handicraft by the same individual.

The stern-post of the "Achilles" is a magnificent forging, and a marvel of Cyclopean working in iron, but its very massiveness and weight fills the visitor with apprehension for the safety and durability of the ship to which it is to be fixed. Placed at the extreme end of the keel, and as far as possible from the fulcrum, it must exercise great leverage, and shake the ship terribly in foul weather. So forcibly does this idea take possession of the mind, that one is disposed to ask whether it would not be possible to build the stern-post cellular fashion, of thick plates riveted together, and stiffened by stays and braces inside; or whether it is absolutely necessary the stern-post should be rectangular in construction; might it not be cylindrical, and constructed after the fashion of Captain Berkeley's guns—*i.e.*, of tubes shrank in one over the other until the requisite strength and stiffness are obtained?

It will be seen, from what has been previously stated, that Chatham has only four docks, and virtually only one, since three of them are occupied by ships in construction. To remedy this deficiency new docks and a basin are to be constructed in Wellary's Island, of which we hope to be able to give an account very shortly.

MOMENTUM AND VIS VIVA.

When we consider that eminent scholars have taken different views upon the measure of the force in a moving body, it is not strange that students, while yet in the elements of mechanical science, should be at a loss to know whether the force varies as the velocity or as the square of the velocity. They do not see why the momentum does not express the force as well as the *vis viva*; or they fail to distinguish between the nature of these two forces; or they do not get a very clear conception of either.

It is not our purpose in this article to enter into a discussion of the measure of force, but to try to show clearly to students the nature of the above named forces by showing the office which each performs in the same moving body.

Vis viva, sometimes called "living force," is a mere conventional term to express the product of the mass of a body multiplied by the square of its velocity. It bears a direct relation to the *work* which the moving body is capable of doing; being just double the work. For whatever be the work which it does, or is capable of doing, we know that the same amount of work may be expended in raising a weight through a sufficient height.

Let W = the weight.
h = the necessary height.
M = the mass of W.
V = the velocity required in falling through h.

Then it is well known that $W h$ = the work done. But from the law of falling bodies,

$$V = \sqrt{2 g h}, \text{ or } h = \frac{V^2}{2 g}.$$

$$\therefore W h = \frac{W V^2}{2 g} = \tfrac{1}{2} M V^2$$

But $M V^2$ = the living force; hence the wor

which a moving body is capable of doing is one-half the living force, or *vis viva*, of the body.

To work is to overcome resistance; hence a body may move and do no work. The fact that it has mass and moves, is evidence that it is capable of doing work; and if it changes its velocity it either performs work or has work expended upon it.

The force which is stored in a moving body is a force of inertia; hence it is equivalent to the force which would cause the body to move from a state of rest to a velocity V, when free to move without any resistance. We see, then, that when a body is moved against any resistance—as air, water, or friction—that the force which would give the body a velocity V, may be divided into two parts: 1st, that which directly overcomes the resistance of the air, water, and the like; and, 2nd, that which overcomes the inertia of the body; and it is by knowing the terminal velocity and the mass that we are able to tell the amount of resistance (in lbs. feet) that the body would overcome without applying to it any additional force.

Before developing this idea further, let us turn our attention to the subject of momentum. Momentum is also a conventional name for the expression $M\,V$. If we were permitted to call it a force, we would say that it is also a force of inertia. It is also called "quantity of motion;" for by knowing the masses of two bodies, elastic or non-elastic, and the velocity of one before impact, we can find their velocities after impact; bodies being supposed to be free to move.

Now, in order to show the office which each performs in moving bodies, let us take a few examples.

Suppose two perfectly non-elastic bodies of equal mass (and consequently of equal weight) move with equal velocities in opposite directions; what will be their condition after impact?

Now, because their *momenta* are equal, we know that they will destroy each other's motion, and hence, so far as their motion is concerned, they will be in a state of rest. And this is all that we can determine from the principle of momentum. It relates to the motion of the masses. But, as a fact, we know that before they came to rest there was a compression of the two bodies, and hence work was done. The amount of this compression depends upon the *vis viva* of the two bodies. By momentum we decide that the bodies will come to rest, whatever be their velocities, provided that they are equal; by *vis viva* we decide that the amount of compression is directly proportional to the square of the velocities. *Vis viva* pertains to compression, or, more generally, to the displacement of particles in respect to each other; hence it is sometimes called the penetrating power.

Suppose that the bodies are perfectly elastic; then, without any knowledge of the principle of *vis viva*, we decide that the bodies will have equal velocities after impact, but in opposite directions. By *vis viva* we know as before, that the amount of compression is proportional to the square of the velocities; but on account of the elasticity the *vis viva* (or work) is all restored, so that there is no loss of *vis viva* in perfectly elastic bodies.

Suppose the bodies unequal, non-elastic, and move in opposite directions.

Suppose A weighs 200 lbs. and has a velocity of 2 feet; and B weighs 20 lbs. and has a velocity of 20 feet, required their condition after impact.

With regard to the motion of their masses, they will come to rest, for their momenta are equal, being $200\ 2 \times = 20 \times 20 = 400$ lbs. feet.

But the *vis viva* of A is proportional to . . . $200 \times 2^2 \times 800$
The *vis viva* of B is proportional to . . . $20 \times 20^2 \times 8000$

hence B performs 10 times the labour of A in producing the compression of the two bodies. This at first may appear paradoxical; but two considerations will enable us to make it clear.

1st. It is possible for one body to do all the labour of compressing both bodies; thus, suppose one body moves against another at rest. Now the body at rest has no *vis viva* (or work) stored in it, but the moving body has; hence it performs all the work of compression.

2nd. In the example under consideration; if A can perform 10 times the labour of B; then A would penetrate a clay-bank 10 times as far as B; if the bodies were of equal size: now how can this be if they destroy each other's motion by impact?

We think the difficulty disappears at once by observing that A has 10 times as many particles to bring to rest as B; and hence B must perform 10 times the labour of A to bring them to rest.

It is worthy of notice that if the momentum of two bodies are equal, then their *vis vivas* are inversely proportional to their masses. For we have $M\,V = M'\,V'$;

$$\therefore\ V = \frac{M'\,V'}{M}.$$

Substituting this value V in the expression for the *vis viva*, gives

$$\frac{M\,V^2}{M'\,V'^2} = \frac{M\left(\frac{M'\,V'}{M}\right)^2}{M'\,V'^2} = \frac{M'}{M}$$

It is well known that if the impact of two non-elastic bodies takes place while they are moving in the same direction, their momentum after impact is the same as before, but there is a loss of *vis viva*. Now this loss is expended in compressing, or otherwise disfiguring the bodies.

Other illustrations might be given, but we trust that these will throw some light upon the dark points which may have arisen in the mind of some reader.

In the last example it was said that the *vis viva* of A is proportional to 200×2^2; but the true value is $\frac{200}{g} \times 2 = \frac{200}{32\ 1\text{-}6\text{th.}}\ 2^2$; and similarly for B. Many writers use the weight for the mass too frequently, thereby producing slight confusion. By making such free use of it, the student is at a loss to know when it is necessary to use the mass.—*The Journal of the Franklin Institute.*

CENTRIFUGAL PUMPS.

THE successive improvements which may be traced through the class of water wheels as chief motors in transmitting power, in which the modern turbines are conspicuous, have also suggested a reverse action, by which the wheels and turbines are changed into pumps, of which many different patterns are now and have long been in use, operating as suction and force lift pumps.

The laws of maximum useful effect, which have been very fully and clearly demonstrated for water wheels, as types, apply to their reversed patterns, as to the form and arrangement of the blades, experiment having demonstrated a large increase of the discharge with a change from ordinary radial to properly curved arms, without increase of power. The following abstract of an experiment by Col. Morin, made at the Great London Exhibition, illustrates this point:—

Form.	Revolutions per minute.	Gals. raised per minute.	Height raised.	Useful Effect.
Curved Vanes (Appold's)	792	1164	18 ft. 8 in.	·649
,, ,, ,, ...	788	1236	19 4	·680
Inclined ,, (45 deg.)	694	560	18	·394
,, ,, ,, ...	690	736	18	·434
Radial ,, ...	624	369	18	·232
,, ,, ...	720	474	18	·243

With the best form of pump which can be devised, useful effect is controlled by velocity and lift, and the value of this motor is confined to low lifts under excessive speeds. Experiments made on Appold's centrifugal pump show a progressive per centage of work done, under a lift of 5·5 ft., with a 12 in. pump, of 21·2 per cent. for 375 revolutions, 59·1 for 400, 71·9 for 495, an increase to 607 revolutions giving 69·2 per cent. To raise water 67·66 ft. required a speed of 1,322 revolutions; and within their special range of application, 70 per cent. useful effect is all that can be claimed for the best motors of this class.

The laws of form, however, have been much overlooked in those in ordinary use, radial blades being common in practice. For bailing large quantities of water from foundations in excavation, where the supply carries much sand and gravel, for wrecking pumps, and like uses, the facility with which dirt, gravel, grain, &c., are passed through these pumps is a strong point in their favour, while they have no claim to merit on the ground of economy in power.

About ten years ago, some of our scientific journals were agitated by a discussion on the merits of a new theory of centrifugal power, which proposed to regenerate the mechanical world, and overthrow the antiquated notion that a machine could not transmit more power than was imparted to it. It was claimed to be demonstrated at the end of much printing, and was admitted by some of our puzzled savans, that by certain mechanical adjustments an increase of velocity might generate a force of 173,824 foot-pounds from a power of 42,480, and twice the velocity would yield 695,296 foot-pounds for 84,960. But, like all wonderful discoveries of the kind, which seem to lead a comet-ary life, it has vanished in silence from the horizon of mechanical science, to return no more, and to be numbered among the stame and cloud engines, caloric steamers, water gasometers, full steam cylinders, and other celebrities of the passing hour.

From the pertinacity with which some of our engine builders have urged the necessity of an equable motion in pumping, we have been somewhat surprised to see so much neglect shown to the rotary pump, which accomplishes their desideratum in the most perfect manner, and the fact of such neglect must be taken as a strong argument against the reliability and economy of this motor.—*Journal of the Franklin Institute.*

SAFETY VALVES OF STEAM BOILERS.

AT a meeting of the Academy of Sciences of Vienna, M. de Burg gave an account of his experiments on the mode of action of the safety-valves of steam boilers. These results are in contradiction with the theoretical propositions upon which the regulations for the dimensions of these boilers have been based: inasmuch as in reality these valves do not rise to a height equal to one-fourth of their diameter, that is, one or more inches, but only so as to leave a passage for the steam whose diameter does not exceed the fraction of a line. These apparatuses, therefore, cannot fulfil their object, which is to give simultaneous issue to all the steam which a boiler can produce when it has reached a determinate degree of tension, and thus to prevent all danger of explosion. To fulfil this purpose they ought to be at least six times, and in some cases twenty times larger than the rules prescribe.—*L'Institut.*

A mass of copper, nearly pure, has recently been discovered in the Mesnard district, Michigan. It is 40 ft. in length, and about 4 ft. broad, by as many in height. It weighs about 50 tons.

The high celebrity of Mr. Locke was not due to the fact of his making railways. Engineers, of first-rate ability, abounded in England at the time. It was, that he made them within the estimated cost, an achievement which would sooner or later have been attained by the ordinary operations of capital. The Grand Junction Railway was eventually constructed for a sum within the estimate, and at an average cost of less than £15,000 a mile. When that estimate is compared with those of Brunel, the "Michel Angelo" of railway construction, it excites no wonder to find with what eagerness Locke's services were courted both in this country and in France. The heavy works on the Caledonian Line, including the expense of platforms and road-side stations, were completed at less than £16,000 a mile. This economical success was in a great measure owing to the adoption of a bold system of steep gradients—an expedient which Stephenson, it appears, disliked to the last, and which was a prevailing feature in his active rival's designs. Locke hated a tunnel, and with embankments and inclines would encounter any difficulty.—*Saturday Review.*

SOCIETY OF ARTS.

ON BOAT-BUILDING BY MACHINERY.—BY D. PUSELEY.

ON Wednesday, the 3rd inst., Mr. D. Puseley read a paper before the Society on this subject. The following is an abstract of the paper:—

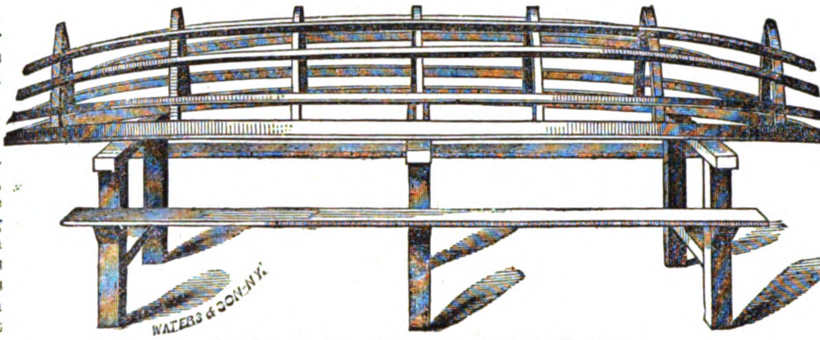


FIG. 1.—ASSEMBLING FORM, WITHOUT FRAMES.

Assembling forms, like boats, are of various shape and sizes. Like the foundation of any other structure, the assembling form in the new system of boat building is the groundwork on which the entire superstructure is raised. While the machines are the mechanical workmen by which all parts of a boat are cut to pattern, or regulated by index to the exact size required, each part fits with the same mechanical accuracy in its allotted space on the assembling form. Every part bears a number or mark that finds a corresponding number or mark on the form. And it is in the great subdivision of labour, by which all parts of a boat are manufactured simultaneously, that the anticipated saving in time and expense will be effected. This sub-division of labour will also apply to the adjustment on the form of the various parts of a boat. And this is the only feature under the new system that requires the exclusive application of manual labour. The final operation must still be performed by those mortal guides without which machinery itself would become a stagnant power.

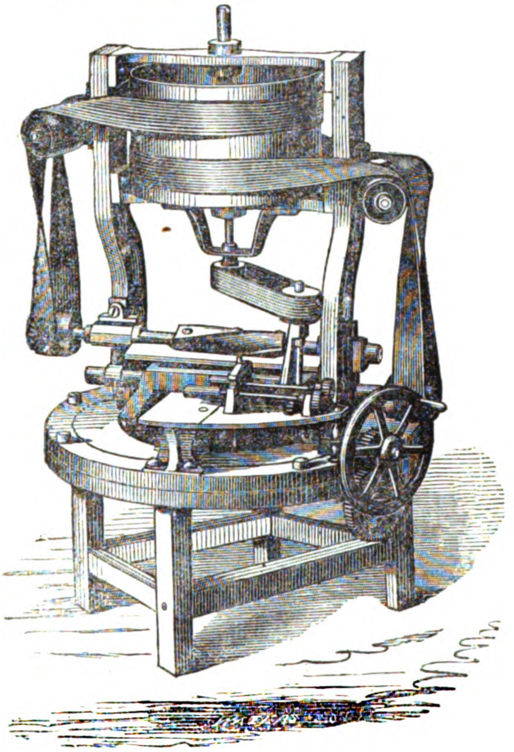


FIG. 2.—DRUNKEN SAW.

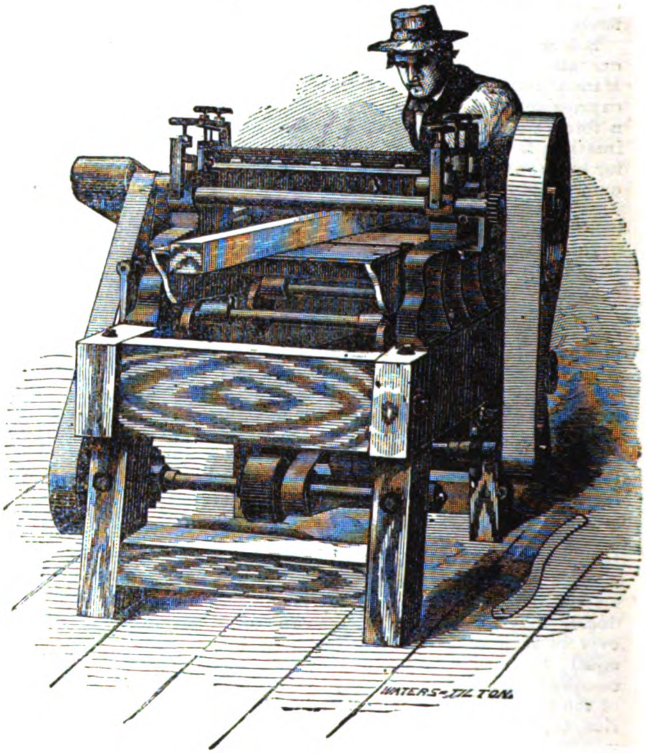


FIG. 3.—PLANING MACHINE.

Before I refer to the machines by which the component parts of a boat are shaped, let me direct your attention for a few moments to the magical performances of a little outsider. Though a grating of trellis-work foot board does not form an integral part of a boat, it is nevertheless a necessary appendage. On the table is the model of a little circular cutter, or—as some call it—a "drunken saw." Yet, even in its unsteady movements, it will accomplish in a few minutes what, by the old system, would occupy one of the most sober of workmen at least half a day. This saw has a lateral as well as a longitudinal set of teeth. By the aid of a small screw lever it is forced from its perpendicular position, according to the width of the cutting that may be required. The irregular or oscillating motion thus produced, when it is revolving rapidly, multiplies the teeth, as it were, till they become a surface cutter or circular plough, that clears everything before it. A counterfeit operation may serve to illustrate the process. Let us suppose that above the surface of the table before which I now stand, this little saw shows its teeth to the depth of the tunnels required in the wood that is to pass over it. Placed on a mechanical guide, the plank is thus conducted over the saw by the workman The result of this operation would be a number of gashes partly through the wood. In another minute the plank has been cut into strips or bars like those on the table. After going through a planing machine, the bars have only to be crossed on the openings prepared for their jointure, and this produces the grating, a specimen of which is now before you.

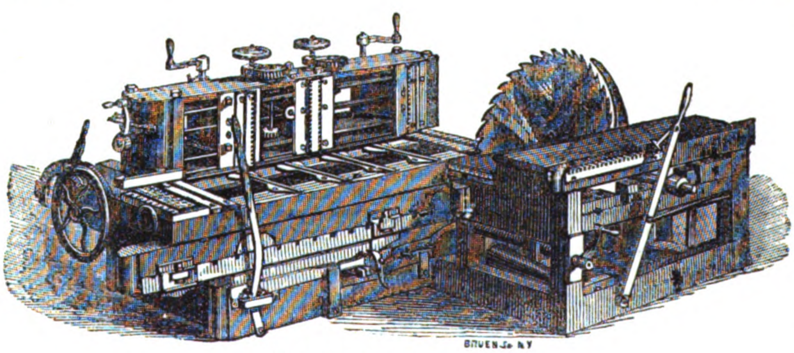


FIG. 4.—COMBINATION SAW.

The *Times* says: — "The whole machinery possesses the same superiority over hand labour that the power-loom has over the by-gone system of knitting. It is the old story of a man working ten hours on wages against a machine that works day and night, and costs nothing but a little oil. Therefore, before long, all boats will be built by steam machinery."

"Here we have the model of what is called a "combination saw" (Fig. 4), a saw for cutting a log of wood into planks. There is nothing very remarkable in the saw itself; but there is a combination of advantages in the mechanical con-

trivances by which the wood is propelled and cut into the various tapering shapes required by the boat-builder.

The next step in the system is to bend these planks into the required form. After they have been prepared for this operation by a steaming process, they are placed under a bending machine, and, by the aid of steam power, they are rounded to the form beneath with as much ease as a boy would bend a small cane across his knee. The woodcut represents the mode of operation, while on the blocks before you we have a couple of planks in their rounded shape. One represents the forward cant, and the other the midships of a boat. The rounded planks, after remaining for some time in a drying room, become as fixed and firm in their new as they were in their original shape. They are then cut into ribs, and, after passing through a planing machine, they constitute the perfect ribs.

As a mechanical curiosity, there is probably not another machine in the entire series to be compared with that which gives to a plank its interior and exterior curve at the same moment. This machine is called a curvilinear cutter or plane. Mr. Thompson was many years before he brought this machine to its present state of perfection, and he worked as only an enthusiastic inventor can work.

On their passage through this machine, the planks required for a boat of any size obtain their interior and exterior curve at one and the same time. The workman or guide has simply to let the index on the machine correspond with the number on each plank; and the cutters or knives, being concave and convex, any degree of concavity or convexity that may be required is at once obtained.

The *Times*, in its notice of the invention, says that "such a machine, up to the present time, has been deemed a mechanical impossibility, and that the search for its discovery has been as futile as that for the philosopher's stone." So says the *Times*. Yet, in the rapid advances now made by scientific men, the *Times* itself can hardly keep pace with some of the "great guns" of the day. Here is a model of the machine, together with a specimen of manufacture.

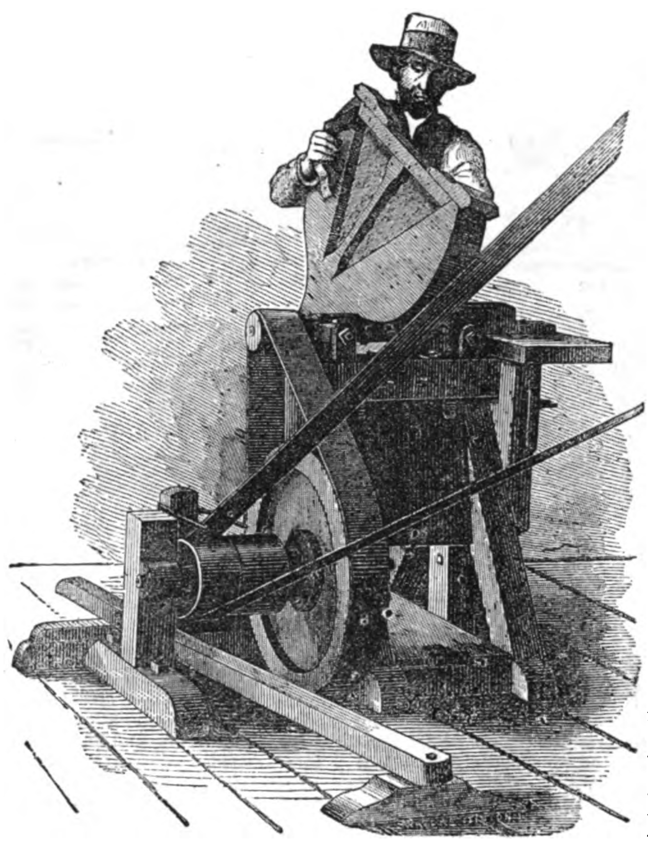


FIG. 5.—STERN-POST MACHINE.

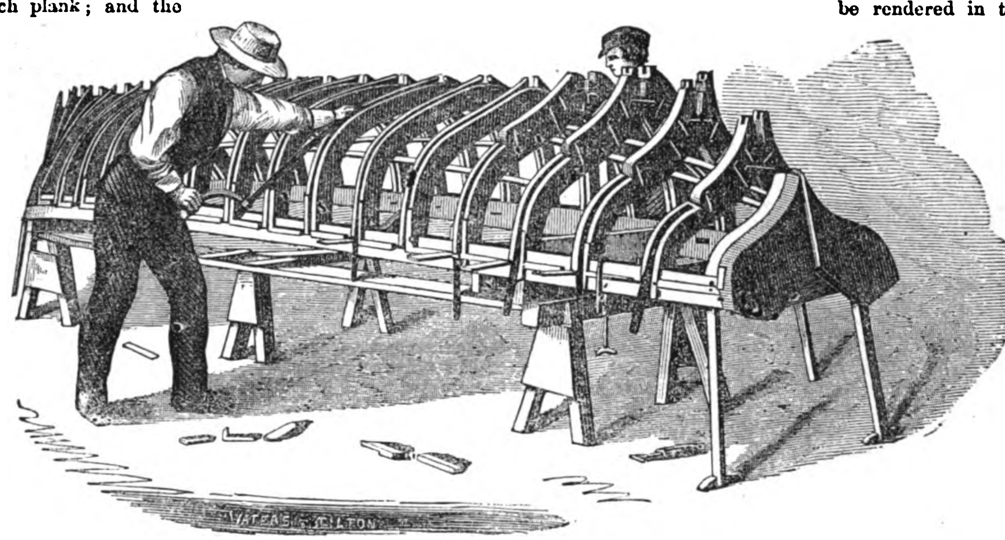


FIG. 6.—ASSEMBLING FORM, WITH FRAMES ON.

To enable those who read this paper to understand it—as well as those who hear it read—it may be necessary not only to offer a few more explanations concerning the machines that are used in the manufacture of the various parts of a boat, but also to furnis one or two more illustrations in order to show the system, after every part has been shaped, by such machines, and is ready for its final adjustment. With regard to the machines, it is impossible to convey a correct idea to others, or for others to form a correct idea of their mechanical peculiarities, unless by a critical and personal examination. While there are nearly twenty machines used in the manufacture of the various parts of a boat (all in operation at the same time), and while the functions of each machine are of a distinctive character, it would take a good-sized octavo volume to enter fully into the particular properties of the entire series. To be fully comprehended, the system must not only be studied in its entirety, but witnessed in operation.

In addition to the cutters previously referred to, here is an elliptic knife, or diagonal cutter. Fig. 5.)

All that can be said (to be understood) is, that the machine consists of a rotating knife, with an adjusting guide, enabling a clean cut to be made on the edge of any plank or block of wood, from a square to an angle or bevel of 45 deg., according to the inclination given. The illustration represents a workman in the act of giving the required bevel to a stern-board. This machine, at the lowest computation, will perform the work of a dozen men working under the old system.

As I have previously stated, every boat built by the new process is built on an assembling form. In the naval and mercantile marine there are (together) about thirty standard sizes, shapes, or classes of boats, and forms to that number will always be kept on hand, while for any person who might require a boat or a number of boats differing from either of these shapes, an alteration, addition, or, if necessary, a new form can be made.

Fig. 6 shows the process of putting the frames on the assembling form, when such forms are ready for adjustment.

And Fig. 7 illustrates the mode of planking, which is the final operation, previously to the boat being hoisted from the form on which it has been built.

There is one point to which I have not before referred. Next in importance to the power of being able to supply the extended demand that must arise in the boat-building trade, through the increased facilities for supply, is that system or process in Mr. Thompson's invention, which enables the inventor to furnish with each and every boat a duplicate part, or duplicate parts thereof. By such duplicate parts, any damage a boat may sustain can be at once repaired, without the delay, trouble, and expense either of of sending it to a boat-builder, or having it patched up by incompetent hands and insecure means. Further than this—accidents to the boat or boats of a ship often occur at times and places in which boat-builders or carpenters may not be within reach; often, too, when, if such aid could be immediately procured, the service required could not be rendered in the brief space that would make it of any use. This want will in future be supplied, and the countless, and sometimes fatal, inconveniences that have hitherto arisen, will be entirely obviated in Mr. Thompson's system, by which the duplicate parts of a boat can be easily fixed.

DISCUSSION.

Mr. Thompson (having been introduced to the notice of the meeting by Mr. Puseley) begged, on behalf of himself and those associated with him, to return his thanks to that gentleman for the way in which he had brought forward the subject. It was, he said, one thing to invent, and another thing to be able to properly describe the invention; he must, therefore, leave it to speak for itself. It was impossible to give any detailed explanation of the various machines, the models of which were before them, further than had been done by Mr. Puseley, and it was necessary to see them in operation properly to understand them.

Mr. Green having pointed out the description of work which the several machines were designed to execute,

A Member inquired how many separate machines were required to prepare all the materials for a boat.

Mr. Thomas replied, seventeen. It was further explained that the machinery now erected at the company's works at East Greenwich was adapted for any boat, from the smallest size up

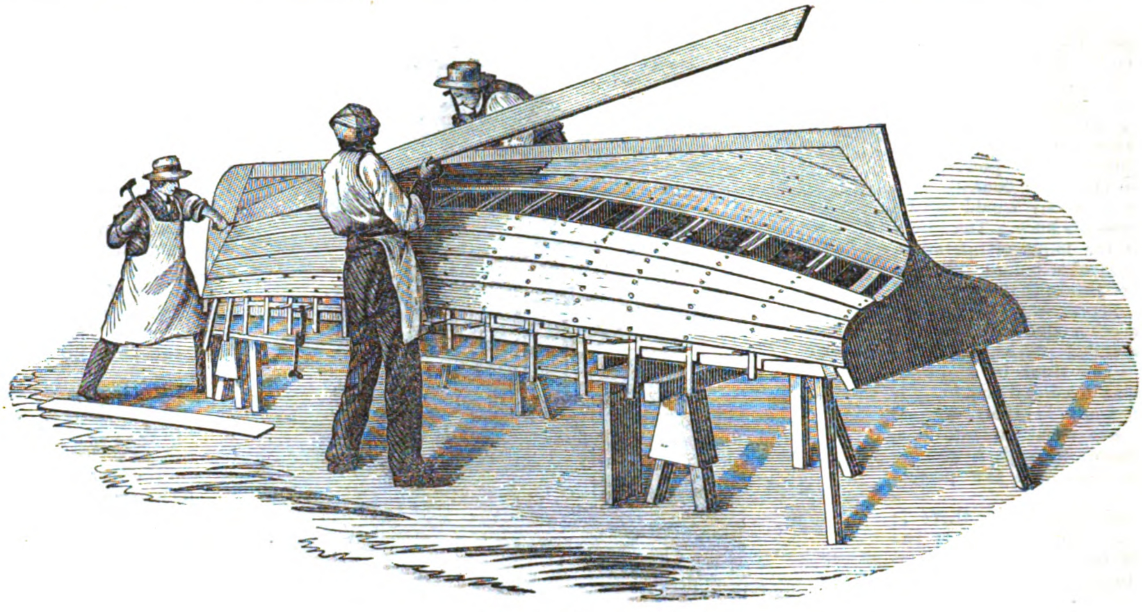


FIG. 7.—PLANKING.

to 32 or 40 ft. in length. The steam-power employed consisted of two engines of 40-horse power each. The only operation left to be performed by manual labour was the putting of the various parts of the boat together on the "assembling form," after they had been prepared by the machinery.

Mr. Peter Graham said, having seen the machinery in operation, he could entertain no doubt of its efficiency as a substitute for manual labour in the preparation of all the parts required for the construction of a boat. The saving effected was in the labour, because the material was the same whether prepared by manual labour or by machinery. Mr. Turner, master shipwright at the Royal Dockyard, Woolwich, had expressed his opinion that the saving in labour effected by this machinery might be represented by the ratio of seven to thirty-two, or, in other words, that the cost by machinery was less than one-fourth that by manuel labour. That, he thought, was a fact of great interest to the commercial community, who might expect to be supplied with boats at a much cheaper rate than heretofore. At the same time, the company by whom the patent rights of the inventor had been secured in this country, expected to realize a fair return for the capital invested. In reply to an inquiry as to how long it took to put a boat together after the material had been prepared, Mr. Graham said that depended upon the number of men employed on the work; but he believed it could be done in from five to ten hours, according to the number of hands employed and the size of the boat. The great advantage consisted in the facility afforded by this machinery of making an unlimited number of *fac-similes* of each particular part of a boat, so that duplicates of parts likely to be injured might be supplied and fitted by unskilled hands in any part of the world. That was important in the case of ships at foreign stations, where there was a difficulty in getting boats repaired. He quite agreed with Mr. Thompson, that in order properly to appreciate this machinery it should be seen in operation; and he might state that as soon as the works were started, which would be in the course of a very few weeks, those who were interested in the subject would be admitted, under proper regulations, to witness the operations.

Mr. Brooks wished to be informed whether Mr. Thompson claimed to be the inventor of that portion of the machinery which was termed the "drunken saw?" Having seen these models in the International Exhibition, he admired the principle upon which they were constructed, but he pointed out to the person in attendance as Mr. Thomson's representative, that there was no originality whatever in the saw described, inasmuch as the drunken saw had been in operation in his own works for the last nine years, and had produced work of greater excellence than the specimens he saw at the Exhibition. Nine years ago one of his workmen invented this arrangement of the saw, and it was a curious coincidence that the term "drunken saw" should then have been applied to it, and repeated in the present instance. He should be glad to be informed whether the idea as to the originality of the invention came across the mind of Mr. Thompson when he took out his patent in 1860. It was not his (Mr. Brooks's) intention to discuss the details of these seventeen various machines. Many of them showed great skill in their design, and were doubtless original, but the question for discussion was not the quality of the workmanship, but who was the rightful inventor of some of the machines of which there were models before them? With regard to a portion of them, at least, he thought they could not be claimed as of American origin; if they were, they must have existed in the brain of Mr. Thompson more than ten years ago. He should be happy to show Mr. Thompson, or any other gentleman, the "drunken saw" which he had had at work for the last nine years, and at the same time should feel great pleasure in availing himself of the invitation that had been given to inspect the works of the National Boat-building Company.

Mr. Thompson said, with regard to the drunken saw, he had laid no claim to its invention. It had been in use in the United States of America for at least forty years. All he claimed was the adaptation of that implement to its present purposes, and the peculiar arrangement for producing the oscillating motion given to the saw. The system of machinery in its entirety was what he laid claim to, and its adaptation to purposes to which it had never been previously applied.

Mr. Puseley said it was distinctly stated in the paper, that while some portions of the machinery were originated by Mr. Thompson, he had also adapted previous inventions to his purpose. He had never claimed to be the inventor of the drunken saw. As a whole, he had adapted this machinery for the purpose of preparing the material for boats in one-fourth of the time it could be accomplished by manual labour.

Mr. Turner (of Woolwich Dockyard) said, about two years ago he inspected Mr. Thompson's machinery, and was much delighted with it. By its means, every portion of the material of a boat was taken in hand simultaneusly, and prepared with a mathematical precision which it was impossible to effect by manual labour. In a boat built in this manner, every part of the structure was brought in contact and fitted accurately. He was altogether delighted with the invention of Mr. Thompson, and wished him every success.

Mr. Thompson begged to ask Mr. Turner whether he had ever seen the same ends accomplished by similar means?

Mr. Turner replied that he had not.

In reply to an inqniry by Mr. Charles Clifford, as to the variety of form and size of boats which could be manufactured by the machinery set up by the company,

Mr. Peter Graham said they had at present twenty-six assembling forms, which were adapted to as many descriptions and sizes of boats. Any variation in the particular form of a boat would, of course, require a separate assembling form; and as these forms were somewhat expensive, it would not answer to make a form merely for half-a-dozen boats of a particular model. The forms already prepared, and the machinery set up, were adapted for boats up to thirty-two and perhaps forty feet in length, and fifty tons burden. If a demand arose for a large number of boats of a particular size and model, the assembling form would be prepared; the machinery could be adjusted to every variety of size. The system was equally adapted for cutters of extremely fine lines and boats of broad beam.

The Secretary said the machinery would fashion the materials for any form of boat that was demanded; but, in order to put it together, an assembling form must be prepared of the model required. If a form was made merely for one or two boats, of course these could not be built relatively so cheaply as a larger number of the same form; but the machinery was adapted for any lines that might be required.

Mr. Peter Graham added, that the cost of the materials would be the same, whether prepared by manual labour or by machinery; but the labour in the preparation was reduced by machinery to about one-fifth that of hand labour.

Mr. Turner remarked that the great point of the invention was the rapidity of production. He believed Mr. Thompson could build a boat complete in five hours.

Sir Thomas Phillips said he thought they were discussing, with too great minuteness, the details of the invention. All that was intended to be done was to submit to the society a series of machines whereby a boat might be built in a very short space of time, with a great economy of labour. To Mr. Thompson certainly belonged the merit of having produced a great many ingenious machines, which he had applied to the effecting of a particular object, and in that he

apprehended the inventor had entirely succeeded. They had been assured, by a gentleman holding an important position in the public service, that he was satisfied that, by these means, a boat could be built in an exceedingly short space of time, which was a most important object to be secured. So far, then, there was neither doubt nor difficulty. Whether or not the system would be productive of any great amount of commercial gain, must depend upon its practical adaptation to the wants of the community. There could be no doubt if, instead of varying indefinitely the type of the boats, they could build boats of a certain capacity of tonnage, upon a particular plan, whereby they might produce a large number of the same type, the economy which was promised by this plan would be secured; but it was obvious that it wovld not answer the purpose of these gentlemen to take an order for a single boat of an exceptional form, inasmuch as the commercial results must depend upon the production of a large number of a given type. With regard to the question whether Mr. Thompson was the inventor of a particular machine or not, that was not a matter of any great interest to this meeting. The question was this — had Mr. Thompson adapted machinery — no matter by whom invented—and rendered it applicable to a new object, which hae never before been accomplished by machinery? If he had done so they would regard him as a public benefactor; the invention was in itself a highly creditable thing to Mr. Thompson, who had no doubt devoted a considerable portion of his life to the production of this system, and if he succeeded in producing great commercial advantages, the public at large would have the benefit of them; but if he did not succeed, he (Mr. Phillips) was sure they would accord to him that sympathy to which all men who pioneered for the good of society were entitled.

The Chairman said that, after the numerous explanations that had been given, very little was left for him to say on the subject, bnt there were one or two points which occurred to him, having witnessed the whole of the operations, and being himself a practical man in these matters. All the materials for a boat might be cut out and prepared by this machinery for putting together. It then required skilled workmen to put the parts together. One point requiring consideration was, that the planking, being cut by machinery, they might fall into the error of its fitting too well, because it was neccessary to caulk it, and if the boat were not built for caulking she would tear herself to pieces. The grating, of which they had seen a specimen, had been produced in a somewhat similar manner for nearly fif.y years past, but not prepared precisely in the same way. It was produced be a series of teeth, on the periphery of a wheel, so placed as to come into action in succession, an arrangement similar to what was used in Woolwich Arsenal for planing gun carriages in 1810. It had been seen that if a boat was required of a different form—whether leaner or broader—it was very easy to fit battens on the outside of the assembling form, so as to adapt it to the required shape. There was a great advantage attending the planking prepared by these means, namely, the cutting of the planks to fit the curves of the boat, without straining them to bring them into position. In point of fact, he believed his friend, Mr. Turner, would say they were in the habit of putting too much stress on a boat, instead of adapting the planking to fit without straining. The rabbeting of the keel, stem and stern, by this process, was very complete, and no man could arrive by hand at the precision which this machinery produced. With regard to the question of duplicate parts, he was not quite.disposed to fall into the views expressed. If they had duplicate parts to take with them they must have literally duplicate boats, but the real advantage was, that duplicates could be kept at foreign stations, where a captain of a ship might take the duplicates and either repair or build a new boat, or three disabled boats might perhaps build two complete ones. The parts prepared by this machinery might be likened to the component parts of a watch, which were made by machinery and sold to a manufacturer for a small sum, and he eventually finished them up to form a complete watch, or even a chronometer. So in this case, with a slight finishing, these machine-prepared parts might produce a perfect boat. With regard to the question of the drunken saw not having been the invention of Mr. Thompson, that was not now before them. Mr. Thompson did not claim it, but if he had done so, it was a question of law, and the man who claimed the patent must make good his right if he could. Mr. Thompson had gone through the fire nobly, and he wished him every success; he was sure this Society would be very glad to thank him and Mr. Puseley for having brought this very interesting subject before them.

Thanks were then voted to Mr. Thompson and Mr. Puseley.

EXPERIMENTAL FIRING OF THE BIG GUN UPON THE "PASSAIC."

According to a New York paper, a few weeks since, the gunboat, "Passaic"—which has already been described in our columns—made her first trial trip, to test her machinery, and also the firing of the huge 15-in. gun in her turret. The experiment with the gun was of great consequence, as it is the largest piece of ordnance ever tried on shipboard. As the port-hole for the gun is only 17 in. in diameter, and the face of the gun is nearly 29 in. in diameter, the shot has to be fired through the hole, because the muzzle cannot enter it. The recoil of the first shot was so great that a large quantity of the smoke from the discharged powder remained inside of the turret. To remedy this evil, a muzzle-box was constructed for the turret, and a second trial trip of the "Passaic" took place on Saturday, the 15th ult., but with results little more favourable than on the previous occasion. The vessel proceeded some distance up the Hudson river, and three shots were fired toward the Palisades. The gun was first charged with 20 lb. of powder, and a shell of 330 lb. weight. Two other shots were then fired, with similar shells, and 35 lb. of powder, when the muzzle-box burst, and the vessel returned; but, fortunately, no lives were lost. New experiments are now in preparation.

The mechanism for operating this gun was invented by Captain Ericsson, and has been highly commended; no offensive jarring from the recoil of the discharge was experienced inside of the turret. A short time since we pointed out the ignorance of the *Times* in descanting upon the working of navy guns. The "Thunderer" stated that it was impossible to operate guns over five tons weight on ship-board. In the case of the "Passaic" its big Dahlgren gun, weighing nearly 19 tons, was handled without difficulty by half a dozen men. The largest guns hitherto used in the American navy have been 11-inch Dahlgrens; the largest smooth-bores in the British navy are only 8-inch, or 68 pounders. The employment of such large guns as the one placed in the "Passaic" is a new and important step in naval warfare. As the diameter of the bore of a gun is increased, the weight of the spherical shot increases according to the cube. Thus, while a round shot, for an 11-inch gun, contains 696·91 cubic inches, the round shot of a 15-inch gun contains no less than 1767·15 cubic inches; hence the necessity for making guns proportionately so much heavier as the bore is increased. The speed of the "Passaic," on her second trip, also exceeded that of the first trip by more than one knot per hour.

Proceedings of Societies.

THE LONDON ASSOCIATION OF FOREMEN ENGINEERS.

On the night of Saturday, the 5th instant, the ordinary monthly meeting of the above-named society took place at 35, St. Swithin's-lane, City, Mr. Joseph Newton occupying the chair. After the transaction of some routine business, and the election of several members, Mr. J. Dickinson Brunton proceeded to read a paper on "Peat." Mr. Brunton commenced his remarks on this highly-interesting subject by referring to the enormous deposits of peat which exist in various parts of the United Kingdom, and to the comparatively fruitless efforts which had hitherto been made to turn that material to useful and profitable account. He stated that the peat beds of Great Britain and Ireland covered an area of not less than six millions of acres, and assuming the average depth of these beds to be 12 ft., and this was a low estimate, each acre would yield 3,600 tons of dried peat. The aggregate quantity of peat in these islands would, therefore, yield twenty-one thousand millions of tons, and this would give a supply of twenty-one millions of tons per annum for a thousand years! The questions next arose as to whether it was possible to convert this store of raw material into fuel, and to make it, not only serviceable, but a profitable article of commerce. From a series of experiments which had recently been made under his own observation, Mr. Brunton believed that peat might be so treated as to make it a formidable rival to Coal and Coke, both as regarded efficiency and cost.

In proof of this the writer of the paper pointed to a number of specimens of peat in various stages of conversion, which were placed on the table before him, and to some samples of Iron which had been smelted by the use of peat charcoal alone. These specimens and samples were passed round to the numerous members who listened to the paper, and so far as it was possible to judge from such evidence, they all seemed willing to allow that a considerable amount of success had been attained by Mr. Brunton and his co-experimenters. The peat had been converted into dense hard masses, evidently capable of withstanding the blast of an iron furnace; whilst the iron, which had been produced from iron-stone lying beneath a peat bog near Sligo, in Ireland, presented all the appearance of the finest importations from Sweden. Mr. Brunton next explained to his audience the mode by which the peat fuel had been produced in the state in which it was now exhibited. A simply-constructed machine, of which a diagram was shown, was the principal agent in the work. When the peat was dug from the bog it was thrown into a hopper at the top of the machine, and immediately beneath the hopper was a strainer formed of perforated metal. Within the strainer was an iron archimedian screw running upon vertical axes. At the bottom of the strainer a small opening was left, and through this, very coarse, undecomposed roots and fibres, which would not pass through the perforations of the strainer, fell. By turning the screw the small fibres of the peat were cut up by forced contact with the sharp edges of the perforated metal, and becoming assimilated with the decomposed parts of the peat, passed through the perforations.

A strainer, of 2 ft. in diameter, with perforations of an eighth of an inch diameter, and 15 to the square inch, contains about 12,000 holes, equal to an aggregate aperture of 1 square foot, and this was made to discharge about 8 tons of peat per hour. When in operation, the decomposed peat exuded through every hole in the strainer, and, dropping in vermicular form, upon an endless band, was conveyed by it to another contrivance, closely resembling a brick-making machine. In this the peat was moulded into form. As the strainer was enclosed in a heated chamber, with an opening for the escape of steam, the moisture was driven rapidly off from the worm-like strings, as they fell upon the band, and the subsequent solidifying process was thus facilitated. A very short time sufficed for drying the resulting blocks of fuel. No kind of compression was exercised, and very little power was required either in disintegrating the fibres, or shaping the blocks.

Such in reality were the sole means employed in the preparation of the material to which had been given the name of "Condensed Peat." Several certificates from eminent practical engineers, who had tested it in the furnaces of marine, locomotive, and stationary engines were read, and these were all favourable in the highest degree.

At the conclusion of Mr. Brunton's extremely lucid paper, the Chairman invited a discussion thereon, and in this Mr. Oubridge, of Messrs. Simpson's, Pimlico; Mr. Shotton, of Messrs. Humphrey and Tennant's, Deptford; Mr. Ives, of Messrs. Grissell's; Mr. Moore, Mr. Zohrab, Mr. Buckle, of the Mint, and other gentlemen took part. Many questions were put as to the cost of the manufacture of the peat, and the price at which the Sligo iron could be supplied. These were all answered satisfactorily, and so far as experiments have gone, under the hands of Mr. Brunton and his friends, there

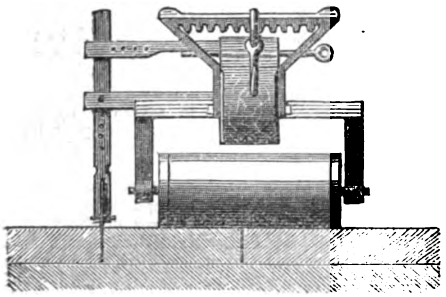
does seem reason to hope that peat fuel may yet play a very important part in the further development of the mechanical arts of the country.

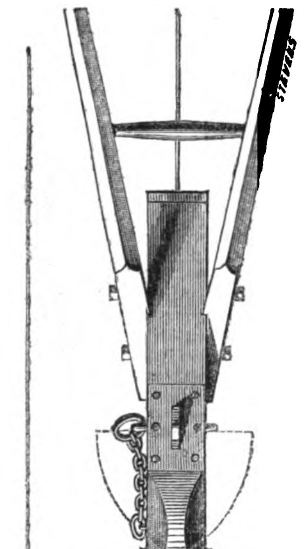
In proposing a vote of thanks to the reader of the paper, Mr. Newton said that he considered the society much indebted to that gentleman for the pains he had taken in preparing it, and that he had thrown a very clear light upon a subject which had been somewhat neglected. It is needless to say that the vote was unanimously agreed to; and at half-past ten, the meeting came to an end.

We have still to regret the non-attendance of Employers at the sittings of this society. They may rest assured that themselves, and not the members of the Association, are losers by their absence; and the great success achieved by the unaided efforts of the Foremen Engineers is the best proof that their course of proceeding is a right one. Such a meeting as that of Saturday last would scarcely have discredited the Institution of Civil Engineers, or the Society of Arts.

COOKE'S TURF CUTTER.

This Invention, just patented by Mr. B. Cooke, of Devonport, relates to a novel construction of implement for cutting turf, the object being to simplify the construction and increase the efficiency

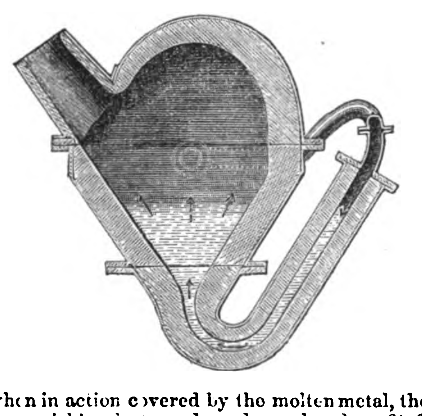




of such implements. In construction, the implement is somewhat like a subsoil plough, as represented in the accompanying engravings. The forward end of the beam is fitted with a brake, which is adjustable vertically by means of a cross pin. On the opposite sides of the beam are wrought-iron brackets, which form the bearings for a transverse roller. This roller precedes the coulter, by which the turf is cut and is intended to level the inequalities in the turf, and remove the hoof prints of the horse. It is made of cast-iron, and hooped with bands of wrought-iron. In rear of this roller is a coulter, the stem of which passes through a socket made for it in the middle of the beam, and carries at its lower end a horizontal share or pointed flat blade, the breadth of which is equal to the width of turf required to be cut. The coluter is held in position by means of metal keys or wedges, and its height is adjusted (to suit the depth of cut required) by a cross pin that passes through the coulter stem, a series of holes being formed therein to receive the pin. The cas-iron roller is fitted with a scraper for keeping its periphery clean. Near one end of the roller runs a guide wheel, in the track left by the last vertical cut of the coulter. This wheel is carried by a stem, which is itself supported by slotted brackets, and thus the wheel admits of being adjusted, both vertically to suit the required depth of cut, and literally to adapt to various breadths of turf.

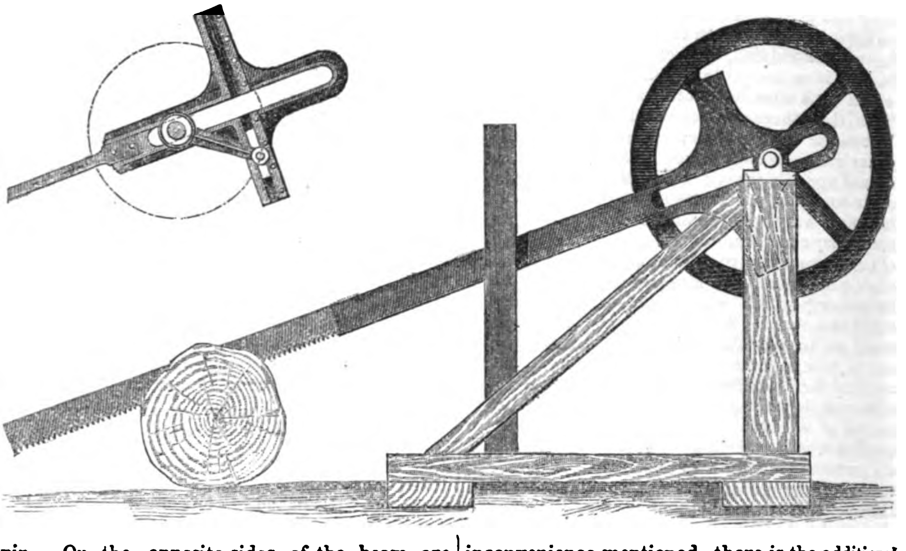
WILSON'S IMPROVED CRUCIBLE FOR THE MANUFACTURE OF IRON AND STEEL.

In the manufacture of malleable iron and steel by the well-known process of forcing atmospheric air beneath the surface of the molten metal, it has been found that by reason of the tuyeres or air pipes being situated at the bottom of the converting vessel, and being consequently always



when in action covered by the molten metal, they are quickly destroyed, and rendered unfit for service. Their renewal is a serious inconvenience, and occasions a serious loss of time, as the converting vessel at each renewal must be allowed to cool down before a fresh tuyere or set of tuyeres can be introduced. In addition to the inconvenience mentioned, there is the additional inconvenience in the old arrangement that the molten metal is apt to flow into the tuyere the moment the upward blast ceases, and thus they become plugged up. The accompanying engraving shows in cross section a crucible just patented by Mr. E. B. Wilson, of Parliament-street. The vessel or crucible is made of wrought iron lined with fire-brick, or other suitable refractory material, and suspended on axes or trunnions for tipping. The tuyere or blast pipe is placed above the molten metal in the manner shown. The arrows show the direction of the air through the metal.

CHILD'S MECHANICAL MOTION.



CHILD'S APPARATUS FOR CHANGING A ROTARY INTO A RECIPROCATING MOTION.

Many of our readers will, no doubt, remember a strange looking apparatus near the south-eastern door and in the American show of the International Exhibition. It was applied to a cross-cut saw for cutting down trees or sawing logs into lengths. This application is the one we now illustrate. The inventor, however, proposes it for any purpose where a change from a rotatory into a reciprocating motion is required.

The change of motion is effected by means of a crank-shaft working in a slot formed in a long arm to which the saw is secured. The end of the crank is fitted with a block which runs in a groove cut in arms or projections formed at right angles to the long arm.

The Post-office money order system has been introduced into Turkey, and postage stamps are about to follow.

A member of the American Institute recently had occasion to examine some very old books, and was impressed with the difference between the paper of which they were made, and the paper that is manufactured at the present day. In tearing that old paper a very rough edge was formed by the long fibres of the material; but if a piece of modern paper is torn, the edge formed is very smooth, showing a very short fibre. This is owing to the use of the material so many times. It is collected and worked over and over until the fibres are broken into short pieces. These broken fibres will not answer for filtering paper, for paper made of them, if placed in water, would be converted into pulp. The filtering paper used in chemical analyses is all made in Sweden. It is retailed in this market at 12 cents. a sheet. Photographic paper was, at one time, all made in England; then in France; but now Saxony makes the best, and principally supplies the markets of the world. It must be made of perfectly uniform materials.

According to M. Michel Chevalier's late paper in the *Revue des deux Mondes*, the Pacha of Egypt has ordered 20,000 uniforms for his soldiers, all the buttons on which are to be of massive silver. We do not know where the order has been executed, but as the buttons are of real silver, we suppose that Germany was not the place.

FIELDEN'S IMPROVED SIGNAL LAMPS.

THE accompanying engravings illustrate a very ingenious invention, recently patented by Mr. A. H. Fielden, of Castle-street, Holborn. It consists in using glass rods or tubes, either in a bent or curved form, for the purpose of obtaining any desired device, or straight, for ordinary lighting purposes. The tubes may be filled with liquids of any colour or combination of colours, and are especially suitable for signalling on railways or in lighthouses. Fig. 1 shows a lighthouse with a lamp of the above description fitted to it. Fig. 2 shows the lamp in use on a railway semaphore. And at Fig. 3 and 4 it is fitted as show lamps, for the outside of buildings and other places. The inventor does not confine himself to filling the tubes with liquid, as they may be of stained glass if desired.

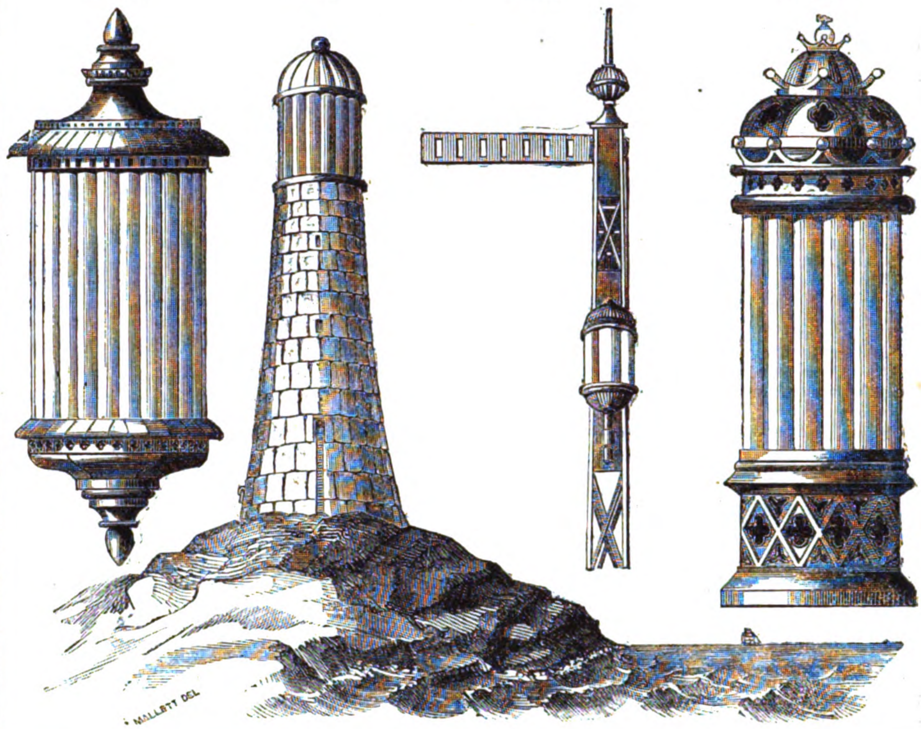
WELLS'S CLAMP FOR JOINERS.

A PATENT has just been obtained by Mr. W. H. F. Wells, of Woolwich, for an improved clamp for the use of joiners and others engaged in working wood. The accompanying engravings illustrate the clamp in two of its simplest forms. It consists of a notched or plain bar of metal of any desired length, according to the purpose for which the clamp is to be applied. When one arm only is used, the end of the bar is turned up to form an abutment or pressing surface, against which one side of the material to be clamped is placed. The sliding arm is self-fixing by its peculiar form, and, when placed in the proper position upon the bar, forms the other abutment. An adjusting screw, fitted either in the head of the bar or in the end of the sliding arm, or in both, completes the clamp. In place of turning one end of the bar up, a plain bar notched in opposite directions, and two sliding arms may be added. The sliding arms are formed wiih a hole or slot at one end, through which the bar can be passed. The arms can thus be moved along the bar so any required position. When a plain surfaced bar is used, these arms are self fixing by the resistance offered by the material to compression when the clamping screw is turned, and, for light work, a plain bar, with an accurately fitting slot in the sliding arm, will be found sufficient. The arm and bar socket may be in one solid piece of metal, or in two parts fitted together with rabits or screw dowels; when made in two halves, or parts, the screw dowels at the back of the bar, when required, are formed with heads projecting a little at the sides, so that they afford the means of slightly diminishing the size of the socket, and thus tighten it upon the bar; an opening of about 1-32 of an inch, being (cut when solid) left when formed in parts for this purpose. For heavy work the arm is made solid, and is self-fixing at and by the notches on the bar. In this case the slot is formed rather larger than the bar, and in an oblique direction through the arm which stands at right angles to the bar when fixed. The arm can thus be inclined a little towarde the head of the bar, or when two arms are used towards each other. In this inclined position the arm or arms can be moved along the bar freely over the notches, and when brought to the required position, and turned square with or at right angles to the bar, the acute angle of the metal side of the slot passes into one of the notches on the bar, and the arm, while it remains at right angles to the bar, is thus rendered self-fixing; a screw or wedge passing into one end of the slot may be added, if necessary.

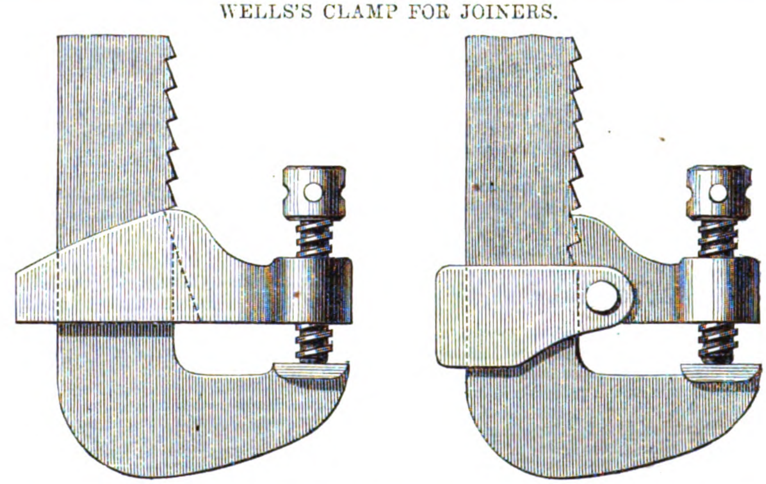
DIAMONDS USED FOR BORING INTO HARD ROCK. —An instrument for this purpose is now being employed in France, made out of a tube furnished with a circular cutter of rough diamonds. It is caused to revolve, and as it enters into the stone the cutter scoops out a cylinder, which is afterwards easily taken out of the tube. Holes in hard granite for blasting purposes, ·47 millimetres in diameter, and from 1·10 metres to 1·20 metres deep, are thereby bored in one hour. This would require two days work in the ordinary way. The diamonds, when examined through a magnifying glass, do not seem at all injured.—*Cosmos.*

FIELDEN'S SIGNAL LAMPS.

FIG. 3. FIG. 1. FIG. 2. FIG. 4.



WELLS'S CLAMP FOR JOINERS.



Legal Intelligence.

THRASHING MACHINES.—Prolongation.— Goucher's Patent, Nov. 15, 1862.—This was an application to the Judicial Committee of the Privy Council, before the Right Honourable Lord Chelmsford, and Lords Justices Knight Bruce and Turner, for the prolongation of letters patent, dated 25th Nov., 1848, to Mr. John Goucher, for an invention of "A machine for thrashing corn and other grain."

Mr. Goucher was examined at great length in support of his petition for a prolongation of the original term of his patent, and stated his invention to consist of an improved form of beater for thrashing machines; the ordinary beater consists of several longitudinal bars, attached to arms or spokes, or to the periphery of wheels affixed to a central shaft or axis with which the beater revolves. Mr. Goucher alleged that this form of beater, on the introduction of steam thrashing machines, was found to crush and bruise the corn; his invention, intended to obviate this objection, consists in making these beaters or bars with grooves or channels on their surface, by which both the straw and grain are preserved from being broken.

The specification describes two forms of beater, one of which consists in forming the bars with grooves or channels on their beating surface: the other plan simply consists in winding iron round the edges of plain bars.

It appeared from the evidence that Mr. Goucher was not able to introduce the new beaters for a considerable time after the date of the patent, and one reason for this was stated to be the great difficulty he met with in procuring bars of such a nature as to stand the wear they are subject to. The patentee had granted a mortgage of his patent to his solicitor, and a peculiar feature in the case consisted in the fact that the mortgagee was not only no party to the application for the extension, but no accounts of his receipts and payments was produced, although they are admitted to have been considerable.

The only question left for consideration was the amount of royalties received by the patentee. But he alleged that (principally in consequence of his experiments upon iron intended for his beaters) he had lost about £2,000, by the patent.

Lord Justice Knight Bruce, stated that their Lordships were of opinion that the invention was one of considerabe merit, and although not satisfied with the accounts, they should recommend her Majesty to grant a prolongation of the patent for three years.

The accounts, including the accounts of the mortgagee, to be laid before the Attorney General, who would determine whether they had been fairly made, and what were the fair results of profit and loss by the invention. Their lordships had further agreed that if the Attorney-General should be of opinion the invention had produced a clear profit of £2,000, that no prolongation should be granted, and also that in case of a new term the mortgagee and inspector should remain in the same position, with respect to it as to the present one.

Mr. Grove, Q.C., instructed by Messrs. Pritchard and Collette, for the petitioner; and Mr. Webster, instructed by Messrs. Tweed and Hughes, of Lincoln, and Mr. J. Henry Johnson, of Lincoln's-inn-fields, appeared to oppose, on behalf of Messrs. Clayton and Shuttleworth, of Lincoln, but the opposers were not allowed to be heard, in consequence of their notice of objections being lodged five days after the time limited by the advertisements for the entry of caveats.

The Attorney-General was present in behalf of the Crown.

At a private hearing before the Attorney-General, the extension to three years was confirmed.

Court of Queen's Bench, Guildhall, December 10.—Simpson and others *v.* Wilson and another.—Sir F. Kelly, Mr. Grove, Q.C., Mr. Bovill, Q.C., Mr. Drewry (of the Chancery bar), and Mr. J. A. Russell, were for the plaintiffs; Mr. Hindmarch, Q.C., and Mr. John C. F. S. Day, were for the defendants.

This was an action by the assignees of a patent, sealed on the 13th of July, 1860, and granted to Mr. Henry Medlock, analytical chemist, of Great Marlborough-street, for improvements in the preparation of red and purple dyes. The plaintiffs, Messrs. Simpson, Maule, and Nicholson, are the well-known manufacturing chemists, carrying on their business at the Atlas Works, Newington-butts, and they sued Messrs. Wilson and Co., also manufacturing chemists, in Jubilee-street, Mile-end, for an infringement of the patent above mentioned, which has acquired considerable value by means of its producing the fashionable Magenta red and purple colours. It appears that Mr. Edward Chambers Nicholson, one of the plaintiffs, discovered, after many experiments, that these beautiful dyes could be produced by a combination of aniline (a substance extracted from coal tar) and arsenic acid, but he also found, on provisionally registering his invention, that the same discovery had been made by Mr. Medlock, and patented some short time previously. Under those circumstances, he and his partners purchased Medlock's patent for £2,000, and the claim under that patent was for the manufacture or preparation of red and purple dyes by treating aniline with arsensic acid, as described in the specification, which was in these terms:—

"I mix aniline with dry arsenic acid, and allow the mixture to stand for some time, or I accelerate the operation by heating it to or near to its boiling point, until it assumes a rich purple colour, and I then mix it with boiling water, and allow the mixture to cool. When cold, it is filtered or decanted. The aqueous solution which passes through the filter contains a red colouring matter or dye, while a tarry substance remains in the filter. This tarry substance, dissolved in alcohol, methylated spirit, or other suitable spirit, furnishes a purple dye. These solutions of colouring matter may be used at once in the process of dyeing, concentrated or diluted, according to the tints required. The mixture of aniline and arsenic acid after being heated may be allowed to cool, and then forms a paste, which may be preserved. When required for use it is mixed with boiling water, and treated as above described. I have found that the proportion of two parts by weight of aniline to one part by weight of arsenic acid yields a good result; but I do not confine myself to that proportion, as it admits of variation."

Almost the sole question in dispute was, whether the words "dry arsenic acid," in the first line of Mr. Medlock's specification, meant anhydrous arsenic acid, or whether they meant arsenic acid not wet or moist, but having in its constitution certain atoms of water. It was clear that anhydrous arsenic acid, or the acid freed from all atoms of moisture by exposure to heat, would not produce the effect desired when mixed with the aniline, and it was also clear that until the acid possessed as many particles of water as are contained in the constitution of what is popularly termed dry arsenic acid, the effects could not be produced. The evidence was extremely conflicting as to the proper meaning in chemistry of the word "dry," some scientific witnesses stating that it implied the removal of all water in combination, as well as any accidentally present, in which case the specification would be bad; and other scientific men asserting that it meant simply not in a wet or moist state, in which case Mr. Medlock would have accurately described the necessary ingredients in his process. The defendants relied upon another point—viz., that the term "dry" was ambiguous, and that the specification was, therefore, bad. The process of the defendants was to use the arsenic acid in solution when treating it with the aniline, and they contended that as dry arsenic acid was specified in Medlock's patent, their process was not an infringement. But the plaintiffs' counsel argued that any one, knowing the chymicals to be combined, might easily use one in solution and evaporate the surplus water, until it was practically in the same condition as if it had been used in a dry state, and that therefore no patent would be worth one farthing if it could be thus evaded.

The Lord Chief Justice, in summing up, directed the jury not to scan the specification in a spirit of hostile criticism, seeking to find out objections, but in the spirit of men desirous of understanding its meaning, and of using the knowledge which it contained. As to the question of infringement, if they were satisfied that the two processes used by the plaintiffs and defendants were substantially the same, their verdict would be for the plaintiffs, although it might have the curious result of giving to Mr. Medlock's patent a wider scope than the inventor himself intended, because it was Mr. Medlock's intention to caution the world to use the arsenic acid in a dry and undissolved state, and it was now found that it could be used in solution.

A Juror asked what their verdict ought to be if they were of opinion that the present process, though substantially the same, was an improvement.

The Lord Chief Justice said that no one, by superadding something, could deprive a patentee of his rights. The improvement might be the subject of a separate patent, but the discovery of the improvement would not give any right to use the substantial process without the licence of the original patentee.

The jury, having been locked up nearly two hours, and being unable to agree, were discharged without giving any verdict.

TO CORRESPONDENTS.

Received.—R. R., A. G., W. A., P. J. and Co., E. B. A., R. H., J. N., G. C. W., P. J. W., J. H. D., B. and Co., J. P. D., R. A., J. P. E.

An Apprentice.—The subject of your sketch, though ingenious, is scarcely suited for our columns.

Iron.—On page 378 you will find your question fully answered. You will get much information on the Motion of Projectiles out of a small work on this subject, by Major C. W. Owen; published by Mitchell, Charing-cross.

Cotton Gin.—We are often asked for our opinion on machines for this or that special work. However desirous we may be of obliging our correspondents, it will be evident that our publishing such opinions would lay us open to the accusation of interested partiality. Our advertising columns are open to questions like these.

Holywood, Belfast, Dec. 4, 1862.

In last week's Magazine, page 341, "The Atlantic Telegraph," ten lines from the bottom, 1,750 ft., ought to be 1,750 fathoms. R. Hoskyn.

Correspondence.

[*We do not hold ourselves responsible for the opinions of our Correspondents.*]

IRON WALLS AND NAVAL GUNS.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Sir,—Again we have the *irrepressible* Mr. Cheverton. He is doing his best to make wood backing as wearisome as he made the "Wave or Straight Line Theory." I should, as I intimated, have let the subject drop, but being invited to answer his arguments, I cannot refuse the task. Having committed myself to the advocacy of rigid *versus* elastic backing, I am bound to dispel the sophistries of a scientific writer, who inculcates an error detrimental to the public service. Every iron-cased ship with wood backing, taking the average expense of her armour, causes an absolute loss of £50,000. If we are to hold our own against the iron monsters of the deep in the service of other nations, our "Warriors," "Minotaurs," and "Caledonias," will have to be stripped of their armour, and made invulnerable at a new expense, so that the outlay on the present system is money thrown away.

Mr. Cheverton is so positive and pretentious with his demonstrations, that having founded them on false premises, as a man of science, he must expect no quarter.

In quoting my *dictum* that greater displacement, as well as greater strength, is attained in naval architecture with iron than with wood, the truth of which he does not deny—feeling that those few words refute his positive argument founded on the specific gravity of material—he has not the honesty to make that admission, but affects to suppose I misunderstood him. Nettled at this rebuke, he attempts to redeem his character, and at the same time to prove the superiority of wood to iron, by a statement referring to displacement, which is so palpable a blunder that, whether inadvertent or wilful, that it reflects equal discredit on a writer who pretends to be a public instructor and a reliable critic on naval construction. In scientific phraseology, he makes out a case after his own fashion, to the effect that iron backing, in lieu of 18 inches of teak, would be a "*cruel burden*" to a "Warrior;" and then, by way of proof, alludes to the lightness and buoyancy of teak, of which he says "the 4 or 5 feet under the water-line, not only bears up its own weight, but one-fourth or one-fifth more." Has he the simplicity to suppose that this natural effect of specific gravity is not well understood? And in lamenting the "cruel burden" of the iron, does he forget that the *positive* weight of the backing, whether in teak or in iron, will be the same? Counting the space which the teak occupied, he must know the displacement and the burden will be equal quantities.

To make good his point, which Mr. Cheverton dilates upon as evidence of his acumen, *he shifts the question by shifting the line of measurement, which determines displacement.* He assumes two different breadths of beam, varying with the thickness of the iron and wood backing, whereas to institute a fair comparison, he should in both cases take the breadth of beam, as it really is, to be the same. There is, then, no more burden with the iron than with the wood backing, the buoyancy is the same; and there is an absolute gain in stowage or deck room, to the extent of the difference between the thickness of the teak (18 in.), and its equivalent in iron 2 in., or a difference of 16 in. on each side of the vessel, making 2 ft. 8 in. more available width between the broadsides in favour of iron.

With this light thrown on the subject, what becomes of the triumphant exclamation, that "it is *obvious at a glance*, that for all which is under water, wood is a relief and iron is a burden to a ship." If a schoolboy, in his first apprehension of specific gravities, gave utterance to this statement, we should smile, and tell him, it was true in respect of solid masses of the two materials, but quite erroneous when they come to be moulded into certain forms, adapted for flotation, for which iron, by its ductility and strength, is far more suitable than wood; and, telling him the story of the wise men of Gosham, we should inform him, that they might swim more safely in a bowl of iron than in a bowl of wood.

To illustrate the absurdity of Mr. Cheverton's method of arriving at his erroneous conclusion, we will take a cubic foot of wood and its equivalent weight in iron plate. We form the latter into a vessel containing one cubic foot, and we demonstrate that, weight and volume being the same, displacement and buoyancy are the same. As an answer, Mr. Cheverton takes a hammer, beats the iron vessel into a mass, throws it into the water, and, with childish glee, shows the metal will sink. But this is a juggle—a pitiful evasion of the truth. By altering the volume, he alters the measure of displacement. In vain will he exclaim that I misrepresent him, but I do not. In attempting to prove that by using 2 in. of iron in lieu of 18 in. of teak as backing to the armour plates of the "Warrior," "the iron defence would

be a cruel burden upon the buoyancy of the ship," whilst the teak would be a relief, he practically has recourse to the juggle I have exposed. In a verbiage, betraying an inexplicable confusion of ideas, he commits blunder upon blunder, "Equal weight," he says, "will give equal displacement." I have shown that volume must be combined with weight, to work out the problem of displacement. Next he says, "the question is not about the weight of the hull of a ship in relation to its strength and capacity, but about its weight in relation to penetrative resistance to shot," and then he reiterates the same idea in three or four other forms, which I need not quote. But again he betrays ignorance of the subject, for the chief aim in the construction of iron-cased ships is, to effect precisely that which the clever critic declares is not the question. The real problem to be solved is how to apply the iron which constitutes the armour, in such a way as that it shall be a *principal element* in the structure of the ship, that it shall add to its strength and capacity, and "that its weight and substance shall offer the greatest penetrative resistance to shot." This he evidently does not understand, and is so wedded to wood, and apparently so incapable of comprehending that a ton of iron fashioned into the form of a vessel, is practically more buoyant, whilst it is much stronger, that it is useless to argue with him; and, truth to say, I am not trying to convert him, but to demolish his mischievous advocacy of wood as a resisting medium to projectiles.

Referring to the comparative resistance of iron and wood, Mr. Cheverton, to support his view in practice, is driven into the absurdity of proposing increased thickness of wood. Thus, in constructing a floating battery, calculated to resist the heaviest guns, if 15 inches of iron were requisite, he woutd cover each side of the vessel with its equivalent—12 feet of timber—making together 24 feet, *versus* 2 feet 6 inches of iron, reducing the available width of a deck of 50 feet beam to 26 feet. In the uncompromising fervour of his love for wood, he would even construct her solid of that material, from broadside to broadside, rather than abandon a principle.

He quotes my description of the effect of shot on the centre of a plate backed with wood, by causing it to dish where struck, and buckle at the extremities, as a proof that wood prevents penetration. But the effect described is quite beside the penetration question: it illustrates the disadvantage of wood in causing the destruction of the fastenings; but, nevertheless, the distortion of the plate does not save it from being perforated. The two effects proceed from the same cause, the yielding nature of the material, whence it arises that the iron is more easily penetrated as well as more easily distorted, than if it were fixed on a rigid backing.

I am as precise in my view of penetrative effect as the severest theorist or logician could desire, and do not seek to evade absolute conditions. But Mr. Cheverton does; he will not fix his mind on the difference between penetrating and crushing effect. The former is purely *local*, and with a rigid backing may be limited to the area of impact; whilst with a yielding backing, not only is penetration made more easy, but the crushing effect is more disastrous. Prevent penetration—stop the shot—you break it up, or hurl it back, and you exclude the foe. The art of constructing invulnerable armour, consists in resisting penetration. This will never be effected by the outer shield—the armour plate proper—unless it be bedded on rigid backing. This law, for as such I regard it, was, in my opinion, settled by the comparative trials on plates of the same thickness, with various backings. The *absolute condition* in those trials was a plate 2½-in. thick. The problem was "will the plate resist penetration best with a rigid or an elastic backing?" The answer by the effects produced was decisive, and is a positive negative to the elastic theory, which practically maintains that you can punch a hole through a plate on an anvil easier than on a block of wood.

When Mr. Cheverton says that iron backing is virtually a variation in the thickness of the plates, he has recourse to that plausible evasion termed "begging the question," and he furnishes the best proof that he is at a loss for a fair logical argument and practical demonstration. At the same time, as it not unfrequently happens to disputants who are predetermined, as he is, not to relinquish a theory, he has unwittingly produced an argument which demolishes his own case. Precisely as he says, the rigid backing does *virtually add to the thickness of the plate*, and thus it prevents penetration. My thanks are due for this curt and happy definition of the principle of rigidity. One more remark and I have done. Given, a thickness of plate, which, without any backing, can be penetrated by a certain force, an inch of *iron* backing will prevent penetration; but, the force being the same, *no thickness* of wood backing will save the plate from penetration. Let Mr. Cheverton and the other advocates of wood backing ponder over that proposition, and if they cannot prove it to be untrue, let them honestly confess they are beaten.

I must not dismiss Mr. Cheverton without alluding to his eccentric idea of soldering iron plates in one mass over the hull of a ship. He calls the process bronzing, and tells us it may be carried into practice; but the scheme is visionary, and, if it were practicable, the result would be that a few broadsides on this tortoise-shell covering would shiver it to pieces, causing long and deep cracks, and strip it off in large fragments.

I have, I fear, been prolix, and at too much pains in refuting Mr. Cheverton. We don't break a butterfly on a wheel, but small obstructions sometimes require an effort to remove them. A writer who affects to govern opinion on a question involving national interests, and who, regardless of reasonable correction, persistently propogates error to the detriment of the public service, must not be dealt with tenderly.

CIVILIAN.

"WHOSE IS MR. WHITWORTH'S GUN?"*

Sir,—The writer of the article which appeared in your paper of Nov. 15th, asking "Whose is Mr. Whitworth's gun?" has evidently been misinformed as to the real facts of the case.

A portion of the correspondence with reference to the construction of that gun (the 7 inch gun lately fired at Shoeburyness), took place between Mr. Anderson, of Woolwich, and ourselves as a firm: during a part of the time occupied in its construction, Mr. Whitworth was prevented by illness from giving it attention.

We shall feel obliged if you will give us an opportunity of stating simply what are the real facts and how they occurred. Your readers will then see that the writer of the article must have been misled by incorrect information.

At the latter end of last year, Mr. Whitworth requested permission to have a heavy gun (7 in. bore) made on his plan at Woolwich, in order that he might try upon a target, like the "Warrior," the effect of shells he proposed to make. The reason for making this application was simply that our works in Manchester were not at that time in a position to make a gun of the required size. The facilities for doing it existed at Woolwich, and similar permission had previously been asked for and obtained by several other persons.

December 7th, 1861, Mr. Whitworth was informed that the War Office sanctioned the manufacture at Woolwich "of a 7-inch gun made according to your (Mr. Whitworth's) principles, and made under your directions."

Mr. Whitworth, a few days after, came to London, and arranged for the manufacture of the gun. Soon afterwards, we sent to Woolwich a drawing of the gun proposed to be made. Its breech was closed by a screw, of a kind not, we believe, previously used, except by ourselves in our 70-pounder guns. It is a triple screw, having three different diameters on a common axis; these take simultaneously into three internal screws, the smallest fitting in the end of the bore, the other two screwing each into the end of a hoop, of a kind not, as we believe, previously used, except by ourselves in our 70-pounders. It is a screw having three different diameters on a common axis.

Instead of this screw, Mr. Anderson proposed to use a tube closed at the breech end, and sent, Dec. 19, 1861, us a drawing of a gun, finished to the outlines of your (Mr. Whitworth's) drawing, and showing the modifications founded upon it which he suggested.

Mr. Whitworth's partner, Mr. Hulse, then went to Woolwich, and conferred with Mr. Anderson upon the modifications suggested, and a third drawing was the result. We subsequently supplied, upon request, the necessary gauges, and sent written directions as to the bore, rifling, windage, &c.

We refer to these details, merely to show that we were in constant communication with Mr. Anderson during the construction of the gun, and that it was made as originally directed by the War Office, "according to Mr. Whitworth's principles, and under his directions."

After this explanation, it cannot be said that Mr. Whitworth was in error when he stated, in his letter to the *Times*, that his 7-inch gun was made according to drawings supplied by him or his firm.

He expressly acknowledged the ready and valuable assistance received from Mr. Anderson. He also stated that he should feel pleasure in making similar acknowledgments to Sir William Armstrong, if he would point out what invention of his had been used in its construction. This, neither Sir William nor the writer of the article in your paper has done.

In no respect whatever, as far as we are aware, was any suggestion ever made, or any advice given, by Sir William Armstrong as to the construction of the gun; nor has he in any way whatever had anything whatever to do with it, or the drawings from which it was made.

But it is said that the gun was made on the coil principle, and therefore Mr. Whitworth was indebted to Sir William Armstrong. This obliges us, in order to prevent further misapprehension on this point, to state very shortly something of what was known of the coil principle in this country before the Armstrong gun was introduced.

We avoid making allusions to the claims that may be put in by contemporaries, and will refer to the well-known published accounts of those who, as Mr. Whitworth said, "were equally predecessors of Sir William Armstrong and himself."

The Blue-books of the Patent Office describe the methods of making guns employed between the years 1830 and 1850, by Richards, Horton, Aspinwall, Cowper, and others; all these adopted the coil principle for the manufacture of ordnance of various calibres.

We will take one case, as it is perhaps necessary to show that these were not mere crude suggestions, but that full descriptions are given both of the method of making a gun on the coil principle, by welding cylinders formed of coiled bars, and of the machinery employed in the coiling and welding process.

We will, therefore, refer, as an example, to the method adopted, and very fully described with drawings, by Mr. Aspinwall. (See Blue-book Specification, No. 10,013, January 16, 1844.)

He says, page 2, line 21, his "improved cannon are formed of wrought iron or steel, first formed with separate rings, or short hollow cylinders, which are joined together end to end." The rings are formed, pp. 12, 13, 17, by "winding a bar of iron or steel in a spiral form, by winding machinery."

The ring so made is heated in a furnace, and welded to form a cylinder by end pressure.

Sir William's first gun was made, we believe, in 1855. His application for a patent for his gun was made in February, 1857.

Mr. Whitworth, in the specification of his patent of December, 1854, describes guns made of segments and hoops, which, he says, may be put on in a second series. The hoops used by Mr. Whitworth were made of welded coiled iron. He may, therefore, be said to have anticipated

* From the *London Review*.

Sir W. Armstrong in using the coil principle, though we fully admit that others preceded him.

The cylinders so formed are heated and connected end to end, by welding them also by pressure, which is given, "by hydrostatic or hydraulic press, or screw press, or any other press" (p. 11).

Such being the method of using the coil principle for making guns previously adopted (and to which we have in self-defence been compelled to allude), Sir William Armstrong used it, as he was entitled to do, in his way for his purpose.

So far from wishing to detract from what was due to Sir William Armstrong, Mr. Whitworth freely admitted that he was entitled to full credit "for practically carrying out the system." That admission did not, however, shut out Mr. Whitworth from using, like Sir William, that which the predecessors of both had employed, and for that reason he asked Sir William to point out what invention of his had been used in making the Whitworth 7-inch gun.

The writer of the article also asks if Mr. Whitworth claimed the invention of the solid bar for the inner tube? Certainly not; it was well known before.

But it must be admitted, that while Sir William Armstrong has advocated the use of cylinders formed of welded coiled bars united end to end, like Mr. Aspinwall's, Mr. Whitworth has deprecated their use, and we have always used a solid bar of homogeneous metal, bored out, for the inner tube of the guns made out at our works. He was therefore justified in pointing to this distinction without meaning to claim the use of the solid bar as an invention.

With regard to the evidence of the president of the Ordnance Select Committee, General St. George, quoted in your article, stating that Mr. Whitworth "found that homogeneous iron did not answer for large guns," we can only say that every large gun we have made has had its inner tube of this very iron, and that we are now making them entirely of that metal, as we have always made our field-guns and rifle muskets.

We cannot close this letter without expressing our great regret that the success of Mr. Whitworth's late trial appears to have called forth a feeling of animosity which we have no desire to reciprocate.

While we are compelled to reply to unfounded statements, we desire to do so with all courtesy, and without detracting from the merit which we acknowledge to be due to others.

We are, Sir, yours very obediently,
The Manchester Ordnance and Rifle Company.

28, Pall Mall, Nov. 27, 1862.

FOREIGN LOCOMOTIVES.

Sir,—In your notice headed "The Foreign Locomotives in the International Exhibition," at page 325 of your journal, for November 21, you give a description of an Austrian engine, called the "Duplex," and couple with it the observation that, "the way in which the complete balancing of the parts has been carried out, is to some extent a renewal, *in a much improved shape*, of an invention of that veteran schemer, Mr. L. R. Bodmer, of Switzerland, &c." (should be Mr. John George Bodmer.) You also explain very correctly that, according to Mr. Bodmer's plan, the cylinder of an engine had two pistons, and two piston-rods working one within the other, with a connecting rod to each; the pistons alternately advancing towards, and receding from each other in the cylinder. And you conclude, by saying that there are one or two large engines upon this plan still extant in the Lancashire districts; that they require occasional "doctoring up;" and that one of the weak points of the latter arrangement consists, of course, in the tubular outside piston rod, which continually causes trouble, particularly from the necessarily weak attachment of the piston.

Having seen the whole of the engines made by Mr. Bodmer, from the first to the last, in operation, I hope you will excuse me if I take the liberty of making a few remarks upon the statements made by you in regard to them.

In the first place allow me to observe that the object Mr. Bodmer had in view in "scheming" and carrying out the double piston or compensating principle, was to confine the strain arising from the pressure of the steam, on the one hand exclusively to the cylinder, on the other hand exclusively to the piston and connecting rods, and to the cranks. Now, as soon as two cylinders are employed, the compensating effect becomes partially neutralized, and the framework and foundation of the engine must suffer in a corresponding degree; and in the case of a locomotive engine, an injurious lateral, as well as an oscillating and reciprocating motion, must be the consequence.

That these defects are reduced to some extent by placing the cylinders as closely as possible together, I admit; but I am somewhat at a loss to understand how, in point of implicity, there can be an advantage in aving *two* cylinders, *besides* the double set of pistons, piston rods, and connecting rods.

I do not remember that the mode of attaching the piston to the tubular piston rod proved to be an objectionable feature in Mr. Bodmer's engines; nor am I aware that there is anything in the nature of a hollow piston rod to prevent its being made just as solid and substantial as necessary at the point referred to, as well as at any other point. It is, no doubt, a drawback to have two connecting rods of unequal lengths, and perhaps the slight extra wear and tear, owing to this peculiarity of construction, may, to some extent, justify the insinuation of the "doctoring" required. But, Sir, the double piston principle is quite independent of tubular piston rods and connecting rods of unequal lengths, and can be carried out in all its integrity, if need be, by the use of the most old-fashioned and ordinary, and therfore, of course, perfectly trustworthy and safe means of connecting the piston with the crank.

The majority of those of Mr. Bodmer's compensating engines, which are, at the present day, at work in Lancashire, are of 60-horse power, and non-condensing. And it may not be uninteresting to some of your readers to know, that they are of the inverted cylinder kind; that the crank-shaft, which is of cast iron, makes 120 revolutions per minute, and that the foundation consists simply of a few feet of brickwork. So complete is the counterbalancing effect of the double piston system that the pedestal caps can be removed and the engine worked at its usual speed without the crank-shaft being in the least displaced.

Steam-engines capable of working at great speed without involving undue wear and tear, are now urgently wanted, especially for screw propellers. Mr. Bodmer foresaw that such a time would come; and I venture to suggest that some of those engineers who make the steam-engine their speciality, instead of putting themselves to the trouble, inconvenience, and expense of attempting to balance the action of their engines by pressing into their service two, three, and even four cylinders, in all conceivable positions, should for once try Mr. Bodmer's far more simple and thoroughly efficient plan. That gentleman has now been so long absent from England that I feel convinced nobody would blame such enterprising engineers for adopting one of his ideas, even if such adoption happened to be accompanied by an open acknowledgement of the source from whence that idea was derived.

There can be nothing startling in the idea of having two pistons, each traversing only one-half the length of the cylinder; there is nothing new or startling in having two or more connecting rods acting upon the same crank-shaft; there is nothing new or startling in making a crank-shaft with cranks placed exactly opposite to each other; and now-a-days, engineers have so much knowledge and experience of their craft, and such appliances for producing accurate workmanship, and for carrying out the most difficult operations, that it would be an insult to them to suppose that they could not find means of dispensing with the tubular piston-rod, if they chose, and still more so, that they could not "scheme" one which would necessitate "no doctoring."

That the double piston principle answers the purpose for which it was intended by its inventor, is unquestionable; and an inspection of one of Mr. Bodmer's engines would, I feel sure, convince an engineer of this fact—the tubular piston-rod, and the long and short connecting-rods, notwithstanding. I am, Sir, &c.,
T. R. Bodmer.

MULLEY'S AUXILIARY RUDDER.

Sir,—I copy from the last month's *Naval Chronicle* a part of the experiments which were made on board H.M.S. "Cordelia," at Plymouth, for the trial of Mr. Mulley's new invented auxiliary rudder. In order to save your space I only make allusion in *italics* to the two experiments which were considered inexplicable to all who witnessed them.

Here follows what I have copied from the *Naval Chronicle*:—"*The auxiliary, tried alone, was found not in any degree to affect the ship's course*;" this was attributed, in some measure, to the fact that the "Cordelia" is supplied with a left-handed screw.

The helm and the auxiliary being both put to starboard, the circuit occupied 7 *minutes* 37 *seconds, the auxiliary thus retarding instead of assisting the revolution.*

The first experiment in *italics* is by far the greatest puzzle, but may be unriddled thus:—The auxiliary rudder (or what may be termed the *fin*) being put over on the starboard side, and the rudder amidships; the fin thus cuts off the current from the starboard run of the ship, whilst the current is acting with its full force on the port side run of the ship, and afterwards is directed upon the port side of the rudder; these current opposing forces neutralize all the turning qualities of the fin.

The other turning experiment, also shown in *italics*, is more easily comprehended and explained; both the rudder and the fin having been placed in the same direction (say on the starboard side), the cotter (the fin) becomes a screw to the former, cutting off a current which otherwise would be directed with its full force on the starboard run of the ship, and would be equal to the force of the current on the opposite side, not only that, but when the current had passed the run, not having any current to meet it, would naturally impinge itself on the port side of the rudder, notwithstanding its position, and thus these two forces, acting in a contrary direction to that supposed to be produced by the fin, would neutralize all the good qualities which the inventor had reckoned upon.

If the fin were placed at the head of the ship instead of in close contact with the rudder, and both placed in opposition to each other, then the greatest result in turning power would be effected in accordance with the inventor's conception.

It is with the greatest diffidence that I make the attempt of solving a riddle which has been deemed inexplicable by those who witnessed the experiment on board the "Cordelia." Should my explanation be deemed obscure without any aid from diagrams, I shall be ready to furnish them should they be required. I am, &c.,
Molyneux Shuldham.
21, Wellington Villas, Commander, R.N.
Dec. 8th, 1862.

GIFFORD'S INJECTOR FOR AGRICULTURAL BOILERS.

Sir,—We are glad to see that you advocate in your journal the adoption of Gifford's injectors on agricultural boilers, for which purpose they are indeed admirably suited.

One superiority the injector possesses over the pump is, that the boiler can be filled by it at such times as it is not convenient to run the engine, and when steam is therefore probably blowing off, as at meal times.

Moreover, when supplying the boiler, the injector not only forces in the water, but, at the same time, heats it to a high temperature (which varies with the pressure at which the boiler is worked), while the feed-pump, on the other hand, sends the water into the boiler, but without in the least degree increasing its temperature. With these considerations in view, it will be seen that economy of fuel may be obtained by the use of this instrument.

Again, having no parts in motion, such parts being liable at all times to get out of repair, and, therefore, requiring to be replaced, it commends itself in districts where skilled mechanical labour is scarce, such as those in which portable agricultural engines are generally employed; and the continual expense of keeping a pump in order is thus entirely avoided.

The method of working the injector is, moreover, so easily learnt, that no difficulty arises in teaching its use to men not thoroughly conversant with machinery generally.

The great majority of explosions that occur to agricultural boilers take place, directly or indirectly, from the want of water. The attendant, not being able to feed the boiler at meal times with the ordinary pump, finds the necessity of water when he comes to start the engine, puts on his pump, the water injected on a hot fire-box flashes into steam, and away goes the boiler. Of course, a careful man would drop his fire and cool the fire-box; but he would surely be abused by the farmer, inasmuch as the whole gang of labourers would

stand idle. The result is, the attendant runs the risk, and every few weeks a sad accident follows.

Now, with the invention of the injector, there is no excuse for this class of accidents, and it seems to be the duty of the press to warn the public on the point.

You will ask, why do the manufacturing engineers allow this state of things? The answer is, because the injecter adds to the price of the engine and boiler some £8 or £10, and they compete so keenly with one another to produce the cheapest article possible, that they are afraid to see their names attached to anything but the lowest prices.

For a 10-horse power portable boiler, working at about 90 lb. pressure, we think a No. 3 injector would be sufficient; the price you will see from the inclosed prospectus.

We shall be very glad if you find the above remarks to be of any service to you,

And are, Sir, yours obediently,

SHARP, STEWART, & Co.

ELECTRO STEERING APPARATUS.

SIR,—I see a notice in your MAGAZINE that "a Mr. Gisborne has taken out a patent for an electric communication with the helm, &c." Allow me, Sir, to tell him, and the public, through your columns, that Mr. Graham Gilmore invented the electric steering apparatus more than *five* years ago; that he had it in use on board a steamer he commanded for two years, that it has been fitted to H.M.S. "Resistance" for more than three months, that it was to have been fitted more than four months since to H.M.S. "Black Prince,' but she sailed unexpectedly for Gibraltar; that the existence of the apparatus was well known to the nautical public, to Capt. C. Coles, R.N., and Capt. Fishbourne, R.N., and to many other naval officers a long time ago; that we are working our telegraph, the firm standing as Gilmore, Preece, Gilmore, and Co., and that we disclaim against Mr. Gisborne having the slightest right, not only to a patent, but to any credit for the invention of "Gilmore's Electric Steering Apparatus."

Trusting you will kindly insert this in your MAGAZINE, I am, &c.,

ARTHUR H. GILMORE,
pro
Gilmore, Preece, Gilmore, and Co.

Woolston, near Southampton,
Dec. 3rd, 1862.

WAS THE FOLLOWING AN INVENTION OR NOT?

SIR,—When quartered with my late regiment, the 34th, at Galway, in 1827-28, I pierced the front side of a steel cuirass, which is formed with an incline, so as to throw spherical shot aside, by firing a flat-faced steel punch against it, from a Standenmeyer rifle air-gun. I previously fired at it, from the same gun, a cylindroconoidal steel punch, but the cone formed front of the punch caused it to glance off without leaving any perceptible indentation. I published this fact several years ago, although I do not now recollect in what publication. I had not, at that time, seen the old English war arrow, with its steel punch-formed, flat-faced head, which was (about six years after) presented to me by a brother toxopholite, the late Mr. Roberts, author of "The English Bowman."

J. NORTON.

Royal Marine Hotel, Bray.

INITIAL AND IMPACT VELOCITIES OF PROJECTILES.

SIR,—If any of your correspondents can supply a diagram and description of the apparatus for determining the initial and impact velocities of projectiles, which is now in use at Shoeburyness, many of your readers will be very much obliged.

5, Keynsham-parade, Cheltenham.

JOHN HARVEY, Capt. R.N.

Meetings for the Week.

MON.—*London Inst.*, "On the Class Reptilia," by R. Owen, Esq., at 7 p.m.

TUES.—*Inst. Civil Engineers*, Annual General Meeting, at 8 p.m.

WED.—*Soc. of Arts.*—" On the Mines and Minerals of the United Kingdom," by R. Hunt, Esq., at 8 p.m.
Geological Soc., 1, "On the Skiddaw Slate Series," by Professor R. Harkness, F.R.S. 2, "On the Fossil *Estheriæ* and their Distribution," by Professor T. R. Jones, F.G.S. 3, "On the Flora of the Devonian Period in North-Eastern America." "Appendix," by Dr. J. W. Dawson, F.R.S., at 8 p.m.
London Inst., "On Heat," by E. W. Brayley, Esq., F.R.S., at 7 p.m.

THURS.—*Royal Soc.*, at 8.30 p.m.
Linnean Soc., at 8 p.m.
Chemical, at 8 p.m.

FRI. — *London Inst.*, "On the Chemistry of the Non-Metallic Elements," by F. Field, Esq.

Gossip.

Some time since we called attention to C. S. Duncan's patent for applying Ratan cane, as a substitute for iron, in the manufacture of submarine telegraph cables. Certainly this substance possesses many qualities essential to a good cable, and just now, when there is a likelihood of another Atlantic cable being laid, it is desirable that Ratan cane should be considered and experimented upon. There can be no doubt of its lightness, flexibility, and strength, but we are not sure that "marine insects will not touch it." Perhaps Dr. Wallich, or Professor King, could throw some light upon the subject. When it is decided to lay another Atlantic cable, we hope the company, for the sake of the great interests involved, will not commit itself to any cut and dried scheme, without exhaustive inquiry. There was too much precipitancy and exclusiveness in laying the first cable, and we find a lingering prejudice in many minds as to the result. We hope, therefore, that not only Ratan cane will have due consideration, but every honestly suggested experiment.

On the 28th ult. we drew attention to a regulation just then issued from the department of the Controller of the Navy directing that the Kynaston disengaging hooks were to be in future fitted to the stern and quarter boats of all ships brought forward for the first class steam reserve, and for commission, and which order virtually excluded from the service Clifford's boat-lowering apparatus, by which so many lives have been saved at sea, both in the Royal and Mercantile Navies. In consequence, the subject was brought prominently before the Lords of the Admiralty, and their lordships have written to Mr. Clifford, officially, to inform him that the captain of any of her Majesty's ships, on applying for his boat-lowering gear, is to be supplied with it as heretofore. It is to be hoped that this decision of their lordships will not be rendered nugatory by contrary orders issued from the office of any subordinate department.—*Times.*

A number of Armstrong 40-pounder and 100-pounder wedge guns are in course of manufacture in the Royal gun factories, at Woolwich, at present; and at Elswick, Sir William Armstrong is engaged in testing a number of 100-pouuder guns in preparation for the forthcoming important competition between the two rival manufacturers, his own and Mr. Whitworth, to take place at Shoeburyness. The Select Committee of Woolwich Arsenal have received instructions to attend the trials, and deputations of the Royal Artillery and Royal Engineer officers have been invited to be present. The result of the experimente will, doubtless, go far to decide the relative merits of each gunmaker, and they are, consequently, looked forward to with much interest, and are commented upon freely.

A WONDERFUL BALOON !—*Galignani* describes a newly-invented balloon as being very wonderful :—"The new Montgolfier baloon, invented by M. Godard, the aëronaut, has a capacity of 4,300 metres. The car is provided with an apparatus which enables the aeronaut to ascend without either gas or ballast, and to descend or go higher up at pleasure. This apparatus consists of a kind of stove formed by three cylinders, separated by insulating substances, whereby all danger of fire is averted. The flame is completely under the control of the aerial traveller, and is prevented from rising too high by a cap of wire gauze. M. Godard asserts that he can inflate his baloon in 30 minutes, and load it with from 600 to 800 kilogrammes over and above the weight of his person and his accessories, and, moreover, that his balloon may be pierced with a bombshell without endangering the aeronaut, who can himself cast projectiles of any kind with impunity. Should this new invention succeed, this balloon may be of considerable service in time of war."

THE WINANS' CIGAR STEAMER.—According to a correspondent of the *Scientific American* the Winans' cigar steamer is at the wharf of Messrs. Winans at the ferry-bar, at Baltimore, as harmless as a dove, without any intent of running the blockade to act as a ram for the confederates; but as far as he could learn she was built for nothing but an experiment, as the Messrs. Winans are now building one in London, the same plan of hull, 700 ft. long, with screw propellers, one fore and aft, instead of the wheel surrounding the hull amidship as in the present one. The larger vessel was to be built here, but our national troubles put a stop to it. There is also a water tank here, the same shape as the steamer, which was intended to bring salt water from sea to be used in experimenting, as there was an engine and boiler put up on the wharf for the purpose; but unfortunately for science, on her first trip, the tank was captured by the Government officers at Fortress Monroe; but through the intervention of General Dix it was released. Under these circumstances the Messrs. Winans thought it better to spend their money in a foreign land.

GAS LIGHT IN RAILWAY TRAINS.—It is highly to the honour of the Scottish Central Railway, that it has, of all the railways of Scotland, initiated a movement, the first steps in which ought to have been long ago taken. It is somewhat singular that of all the improvements which have been effected by science in the ordinary conveniencies of life, during the last half century, so little has been done to secure comfort in railway travelling. Of the requisites, none is of more importance—as those who are in the habit of making long journeys are well aware—than a system by which a clear and equable light may be obtained. The filthiness, the dimness, and the expense of the ordinary oil lamps cannot be excused in so great a scheme as a railway. The Scottish Central train which left Edinburgh for the north, on Monday night, was brill antly illuminated with gas, and the trial has been so successful that, so far as regards this particular line and train, it may be looked upon as a *fait accompli*. The gas is supplied from a large boiler at the Perth station, which is filled from the gas-works there. The supply for the train is kept in an india-rubber gasometer of about six feet square, defended by iron rods, and kept in a compartment of the break-van. When full it occupies the whole of this compartment, but as the gas passes away it is compressed by a weight on the top. The gas is conveyed into it, from the boiler, by a large tube in the bottom of the van, and is conveyed out of it to supply the carriages by a smaller tube, also in the bottom. This tube again passes up through the anterior part of the van to the roof, and the gas is thence conducted along the carriages by metal pipes, connected by india-rubber tubing, and passes down by brackets into large and strong glass globes in the various divisions of the carriages. The supply necessary for the double journey to Perth and back, which occupies somewhat less than eight hours, is about 260 cubic feet; and the expense, after the fittings are completed, is estimated at one-half of that of the ordinary oil apparatus. The only objection to the scheme is that it must be confined, except with great difficulty and expense, to trains which do not require to be taken down, such as those for long journeys, and express trains; but, as it is in these that light is most required, the objection is not a strong one. The system has been for some time in operation on the Lancashire and Yorkshire, and London and North-Western Railways, and was introduced on the former line by Mr. Newall, inventor of the patent break. The honour of introducing this great improvement into the Scottish railway system belongs to Mr. Allen, of the Scottish Central line.—*Caledonian Mercury.*

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgments are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the Proprietors of this Magazine. Other Papers are hereby warned not to produce them without an acknowledgement :—

STEAM ENGINES, &c., 1468.
BOILERS AND FURNACES—*none.*
ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 1430, 1445, 1467, 1485, 1492.
SHIPS AND BOATS, including their fittings, 1424, 1425, 1434, 1436, 1448, 1460, 1463, 1466, 1470, 1477, 1493.
CULTIVATION OF THE SOIL, including agricultural implements and machines, 1459.
FOOD AND BEVERAGES, including apparatus for preparing food for men and animals, 1411, 1441.
FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 1421, 1427, 1428, 1452, 1457, 1464, 1475, 1489.
BUILDINGS AND BUILDING MATERIALS *none.*

LIGHTING, HEATING, AND VENTILATING, 1413, 1414, 1418, 1439, 1440, 1483.
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 1412, 1442, 1446, 1449, 1451, 1456, 1461, 1465, 1474, 1476, 1480, 1486, 1488, 1491, 1495.
METALS, including apparatus for their manufacture, 1422, 1447, 1473, 1484, 1487.
CHEMISTRY AND PHOTOGRAPHY, 1453, 1496.
ELECTRICAL APPARATUS, 1482.
WARFARE, 1417, 1454, 1458, 1478, 1497.
LETTER-PRESS PRINTING, 1490.
MISCELLANEOUS, 1415, 1416, 1419, 1420, 1423, 1426, 1429, 1431, 1432, 1433, 1435, 1437, 1438, 1443, 1444, 1450, 1455, 1462, 1469, 1471, 1472, 1479, 1481, 1494, 1498.

1411. E. KOLBENHEYER. *An improved apparatus for making ices and cold beverages.* Dated May 10, 1862.

This consists in arranging apparatus so that, by a winch handle, with suitable gearing and proper connecting and working parts, a rapid evolving motion may, with the utmost facility, be imparted at pleasure, either to an inner vessel turning on a proper pivot, and inserted in a pail or outer vessel, or to a suitable stirring apparatus contained in the said inner vessel, which latter is to contain the cream or beverage to be cooled down, or to be made into ice, by the effect of the ice or other frigorific mixture contained in the outer vessel. *Patent abandoned.*

1412. J. B. CRISTIFINI. *An improved tent.* Dated May 10, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1413. W. CLARK. *Improvements in lamps, and in apparatus for filling lamps with oil and fluid to be consumed.* (A communication). Dated May 10, 1862.

We cannot here give space to the details of this invention. *Patent abandoned.*

1414. H. W. SAWBRIDGE. *Improvements in sliding chandeliers, gasaliers, and other pendent lamps.* Dated May 10, 1862.

This consists of improvements in the slides of such pendent lamps as are required to be raised and lowered at will; and for gas pendents the patentee also dispenses, with the use of water, by the following means:—The inner tube, which in gasaliers convey the gas to the body of the lamp, he removes altogether, substituting in place thereof, a tube of vulcanised india-rubber, containing a spiral spring if requisite. The upper end of this rubber tube is secured to a nozzle inside the cap of the usual ball joint, or to the top connection or neck, which may be used in place of the ball joint. The lower end of the tube is connected under the pommel of the outside down rod, by a similar nozzle or flanged collar. In case of the breakage of the balance chains, the rubber tube prevents the lamp from running down, and if it be applied to a gasalier there is no escape of gas. *Patent completed.*

1415. H. WALKER. *Improvements in making handles for crochet needles, pencils, penholders, and other articles.* Dated May 12, 1862.

The documents relating to this invention cannot at present be seen, an extension of time for filing the final specification having been allowed.

1416. MILNES. *Improvements in portable apparatus for exercising the human body.* Dated May 12, 1862.

This improvement is not described apart from the drawings. *Patent completed.*

1417. G. FUHRMANN. *Improvements in melting and boring cast steel barrels, applicable to fire-arms and pieces of ordnance.* (A communication.) Dated May 12, 1862.

This consists in introducing into the centre of the piece or ingot to be cast, in the mould or ingot mould, a core, composed of any malleable metal easily pierced by a drill or boring instrument. This core naturally forms one body with the steel thus cast, spreading with it in the subsequent operations of forging and rolling, but always preserving the central point, and a diameter which will suffice for the ulterior work. *Patent completed.*

1418. CLARK. *Improvements in smoke-consuming fire-grates.* (A communication.) Dated May 12, 1862.

This relates to a smoke-consuming grate, in which the fresh fuel is supplied underneath that already in ignition, For this purpose the grate is made moveable, and has a rotating motion imparted to it; it is made somewhat in the form of a cylindrical cage, suitable for the purpose. *Patent abandoned.*

1419. I. B. POPE. *Improvements in apparatus for lowering and loading coals, minerals, or other substances.* Dated May 12, 1862.

Here the waggon or carriage containing the coal or other material, is carried on rails from the mouth of the pit or other situation on to the tipper, which is connected to a moveable stage suspended from a pivot, the point of which stage may be lowered gradually by an ordinary spring brake, at the same time that the tipper is upset on the release of its break, the front of the stage being raised to its original position (after the waggon or carriage has discharged its contents) by counter balance weights. The usual screw, which is vertical, has arms mounted on fixed centres in the framework of the moveable stage, and is moveable on its centres so as to become inclined when pressed forwards by a projection on the front of the waggon or carriage, or by the pressure of the waggon when upsetting, but is restored to its vertical position on the removal of such pressure by a counter balance weight. The patentee also uses a horizontal screen in the floor of the swinging stage, a lid specially constructed being connected to the tipper. By this combination of apparatus, the coals or other materials are tipped and lowered gradually, as required. *Patent completed.*

1420. C. J. HARRIS. *Improvements in the manufacture of detector, season, and non-transferable tickets.* Dated May 12, 1862.

This consists in the application to, or combination with, each of such tickets of a photograph portrait of the holder thereof. *Patent abandoned.*

1421. H. S. FIRMAN. *Improvements in apparatus for washing and cleansing textile fabrics or raw materials, and for forcing fluids or moisture from the same.* (A communication.) Dated May 12, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1422. J. H. JOHNSON. *Improvements in casting metals, and in the moulds and cores employed therein.* (A communication.) Dated May 12, 1862.

This relates to certain arrangements of moulds and cores to be used in casting metals, but is more particularly applicable to the casting of the units of the peculiar steam generator, for which letters patent were granted to the present patentee the 30th August, 1859 (No. 1970), and consists of certain peculiar arrangements and constructions of moulds and cores, and in the mode of combining the same, whereby greater accuracy in the casting is obtained, with allowance for shrinking in the casting. The moulds are made in several parts, which are made up either entirely of metal and partly of sand, or other heat-resisting and porous material, the several parts being in all cases so disposed as to allow for the contraction of the casting when cooling, and, if necessary, prevent chilling or hardening of those parts of the casting which are afterwards to be worked, facility being also afforded for the accurate adjustment of the core inside the mould. *Patent completed.*

1423. H. BAYLEY, L. NEWTON, and J. GREAVES. *Improvements in machinery for turning, boring, cutting, shaping, and reducing wood and other substances applicable for the manufacture of various articles.* Dated May 12, 1862.

We cannot here quote the details of this invention. *Patent abandoned.*

1424. H. CARTWRIGHT. *Improvements in propelling and steering screw steam-vessels.* Dated May 12, 1862.

In carrying out these improvements for screw steam vessels, the patentee abandons the rudder as it is at present made and used, and substitutes what may be termed its skeleton, consisting of three sides or bars of an open rectangular frame, the top and bottom bars being united at eight angles to a vertical bar. The open side of the frame must be nearest the stern post, and the vertical bar farthest from it. The forward end of the bottom bar is pivoted into the projecting end of the keel, if there is one, or it may be pivoted into a bearing at the lower end of the stern post. The front or forward end of the top bar is turned upwards, and occupies the place and office of a rudder head, and is subjected in board to the control of the usual appliances for governing the helm or tiller, or to such other appliances as may be required, whereby the helm or tiller may be subjected to a right and left movement, the same as for a rudder. The rear end of the main propeller shaft must project only far enough through the stern of the vessel or through the dead wood or stern post, to be connected by a universal joint to the forward end of a short shaft, which will thereby be caused to rotate with it. The short shaft passes through the open frame, its rear end working in a bearing half way up the rear upright bar, and it carries the screw propeller, which revolves with it, within the opening of the frame; and as the frame can be turned to the right or left like a rudder, and as the universal joint at the front end of the short axis of the screw propeller will at the same time allow the axis and propeller to be turned along with it, the rotary action of the propeller will, owing to its thrust being then at an angle with the course of the vessel, quickly cause the vessel to take a new direction. Thus, with these arrangements, the putting of the helm to port or starboard will have the same effect in steering the vessel by the propeller frame as by the rudder, with the difference that the frame with the propeller will do it more effectively and speedily than the rudder, and will be found reliable in such cases as have lately been reported, and where the rudder was found wanting in effectiveness. *Patent completed.*

1425. W. N. HUTCHINSON. *An improvement in screw propelled ships.* Dated May 12, 1862.

This invention was described and illustrated at page 330 of the present volume of this journal. *Patent completed.*

1426. C. J. NEALE. *Improvements in apparatuses for measuring and registering corn and other grain.* Dated May 12, 1862

The patentee claims constructing apparatuses for measuring and registering corn and other grain with a drum or ring held in an outer ring or casing, and fixed on a shaft connected with registering wheels, all as described. *Patent completed.*

1427. H. ASHWORTH. *Improvements in machinery for opening and carding cotton and other fibrous substances.* Dated May 12, 1862.

Here the patentee makes use of a machine similar to a carding engine. The cotton, tares, or other fabrics or fibrous substances, are supplied to one or two pairs of feeding rollers, which are heavily weighted, and revolve very slowly; by these rollers, which are fluted or covered with needle points, they are delivered to a roller similar to the "lickerin," but covered with strong card teeth, and revolving at a great velocity, which deposits them on to the main cylinder, around which are placed working and stripping rollers or card flats of usual construction. *Patent completed.*

1428. J. L. WILSON. *Improvements in calendering woven fabrics, and in the apparatus employed for this purpose.* Dated May 12, 1862.

Here the inventor calenders, by means of rollers arranged to press and rub a part only of the fabric, leaving other parts plain or uncalendered, so as to produce a stripe on the fabric. *Patent abandoned.*

1429. A. B. FREELAND. *Improvements in the preparation or treatment of hops.* Dated May 12, 1862.

Here the patentee takes the hops, by preference, in the state in which they are usually packed into the pockets, and submits them to heavy pressure, and exposes them for some time to a moderate heat, whilst under pressure. He proceeds by preference as follows:—He employs a press having a rectangular trunk into which the hops are put, a metal plate being placed under, and another over them; the press is then set to work to compress the hops between the two plates, and when sufficient pressure has been applied, the plates are clamped together and removed from the press with the hops between them; in this state they are placed in a stove and exposed to a moderate heat, until the hops become set; they are then removed from the stove, allowed to cool, and unclamped. In this way a solid block of hops is obtained, which may be kept for a long time without any considerable loss of the aroma of the hops, and the hops in this form will occupy comparatively a small speed. He prefers to protect the block during transport, and whilst in store, by sewing it up in a wrapper of fabric. *Patent completed.*

1430. E. F. LANSKEY. *An improved mode of, and apparatus for, working railway carriage breaks.* Dated May 12, 1862.

Here the inventor proposes to utilize the power obtainable from the rotating axles or wheels of the carriages and engines, and applies the same to draw the brakes into contact with their respective wheels, when the speed of the train is required to be slackened. *Patent abandoned.*

1431. T. BUCKNEY. *Improvements in portable "tell-tale" timekeepers.* (A communication.) Dated May 12, 1862.

This invention comprises, among its chief features, 1, the construction and employment of portable timekeepers having no fixed dial and pointers, as in ordinary timekeepers, but in which a removeable paper disc, fixed upon and revolving with a plate actuated by a clock work, serves both to indicate the time to the watchman or other person, and to register the duties performed by such person. 2, The construction and use of portable tell-tale timekeepers, in which the impression of the various type fixed at the various localities are made upon the revolving paper dial by the agency of black or coloured transfer material. 3, The construction and employment of type boxes fixed at the various localities containing a fixed type for making the impressions upon the paper dial of the portable timekeepers, such timekeepers being for that purpose inserted into these boxes, which type boxes, when not used, are secured by a door or lid. 4, The arrangement of the fixed type in the various type boxes at different distances from the centre, and the formation of annular divisions upon the back of the paper dial, corresponding with the positions of such type, so that the impression of each separate type is made upon a different annular division on the paper dial, all as described. *Patent completed.*

1432. S. B. ARDREY and S. BECKETT. *Improvements in machinery or apparatus for manufacturing spindles, part of which apparatus is also applicable to grinding and polishing other articles.* Dated May 13, 1862.

Here the patentees take the spindles in their forged or black state, and heat them, and then place them in a machine or apparatus having a number of dies, which dies are pressed on different parts of the spindles by wedges acted upon by a lever, so as to set or straighten them perfectly, without any hammering, the lever being put in motion either by hand or power. 2, Each spindle, after it has been straightened, is centred and squared at one end, and placed in a machine or apparatus to be grooved in a self-acting manner, and instead of driving the spindle by a catch and driver, as at present, the patentees place the square end in a plate or chuck having a square hole to receive it, the plate or chuck being attached to the mandril of the headstock. The aforesaid machine is provided with centres and revolving stays for holding the spindles, and a pulley for giving it a revolving motion. The grindstone has a reverse motion to that of the spindle, and is guided longitudinally by a shaper corresponding with the desired shape of the spindle, there being a spring for the purpose of causing the flame and stone to follow the shape of the shaper, and also to adjust the revolving stays, so as to adapt them to the varied sizes of the spindle. It is evident that this apparatus can also be applied for grinding and polishing other articles. 3, They form in the interior of the wharve a number of shallow slots, so as to form a number of projections which yield to the exact size of the spindle, and enable the wharve to be pressed on to its place without endangering the truth of the spindle. The slotting of the wharves and pressing them on the spindles are both performed in an apparatus consisting of a press worked by a screw, from which the nut can be detached at any part, so as to allow the screw of the press to rise to its original position without loss of time. *Patent completed.*

1433. J. H. JOHNSON. *Improvements in the modes of carrying out submerged and other engineering works.* (A communication.) Dated May 13, 1862.

It is by this invention proposed to use a casing of any suitable impermeable and flexible material, inside of which the operations necessary for the carrying out of the works are performed, so that the workmen will always be enclosed in a water-tight and weather proof chamber. *Patent abandoned.*

1434. J. D. CAVILLET and J. P. F. GANDON. *Improvements in paddle-wheels, applied either for propelling steamboats or as prime movers.* Dated May 13, 1862.

This consists in a peculiar arrangement and combination of the paddles or pallets of water-wheels used either for propelling steamboats or as prime movers, which paddles are hinged on horizontal shafts, properly disposed around the circular plate or frame of the said wheels, so that these paddles move freely on their shafts as the wheel revolves. The hinging point being at about the third part of the length of the paddles, the longest or heaviest side falls freely downwards when out of the water, and when the fluid presses on them, the longest arm of the said paddles bears against stopping rods or bolts fastened in the wheel on each side of the paddles, so as to stop its hinge motion on either side in the most advantageous position, either to work or slide through the water as the wheel revolves, allowing them to

take a radial position, which is maintained as long as they work, and is modified before getting out of the water, so as to avoid their raising any of the fluid, as is the case with common paddle wheels. *Patent abandoned.*

1435. P. M. LOPEZ. *Improvements in apparatus for sowing wheat or other grain or seeds.* Dated May 13, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1436. J. B. SARDEY. *Improvements in the construction of ships of war and other vessels.* Dated May 13, 1862.

In order to obviate the difficulties experienced in constructing iron-clad steam ships, carrying powerful machinery and formidable armament, which greatly increases their draft of water, three or more keels may be used, according to the size of the vessel, and two or more stern posts, having between each a central keel and run inclining from the after body of the ship, and terminating at the main transom. By this arrangement a very flat bottom, with easy bilges to the hull and good sailing lines, can be obtained, with a greater width of beam than usual, extending very far aft, and the stern extending in one body above and abaft the rudders and screws to protect them, and to be constructed for the purpose of a battering ram if required. The invention relates, 2, To the use of a battering ram built on one or both ends of the said vessel, for the purpose of acting against other vessels or structures. *Patent abandoned.*

1437. W. E. NEWTON. *Improvements in coffee-pots and boilers for culinary purposes, parts of which improvements are also applicable for generating steam.* (A communication.) Dated May 13, 1862.

This consists—1, In combining a convolute or coiled tube with a boiler, central tubes, and perforated food holder or receptacle, so that, when heat is applied to the apparatus, and the water commences to be heated, a circulation or current will be formed within the boiler, and the water very soon heated and boiled, while the substance or material to be boiled will be disposed in the most advantageous manner in the current of water, to form the cooking or extracting process. 2, In using, in connection with the boiler, a coiled tube and food holder, or receptacle, aforesaid, one or more supplemental chambers or vessels placed under and over the other, and communicating with each other, and the boiler by a tube or tubes, constructed and arranged to favour the ascent of steam or heated air, with the supplemental chambers for warming or cooking articles of food, and, at the same time, serve as a means to keep the cover or lid of the receptacle or boiler in proper position. *Patent abandoned.*

1438. A. WORMULL. *Improvements in trepanning instruments.* Dated May 13, 1862.

This consists in constructing these instruments so that the cutting tool may have the required rotary motion communicated to it by means of some convenient mechanical arrangement of gearing, instead of this motion being given by the twist of the operator as heretofore. The invention is not described apart from the drawings. *Patent completed.*

1439. G. BLAKE. *Improvements in apparatus for warming apartments.* Dated May 13, 1862.

This relates to a peculiar construction and arrangement of a warm-air stove, and consists in causing such stove to be heated by a fire placed externally thereto, in lieu of the fire being situate inside thereof, the air being heated as it passes through the interior of the stove. In order to present as large a heating surface to the air as possible, it is proposed to apply a number of surface-plates, or partitions, inside the stove, the air passing through the intervening spaces between such plates or partitions. *Patent completed.*

1440. J. H. JOHNSON. *Improvements in the purification of colza, rape, and other oils.* (A communication.) Dated May 13, 1862.

Here it is proposed to subject the oil under treatment to violent agitation, in a suitable vessel, with a view to the mixing of air or gas therewith, sulphuric acid being poured gently into the oil during such aërating process, in lieu of using beaters, agitators, or other mechanical means, for mixing the air with the oil; a perforated pipe may be placed near the bottom of the vessel, and air or gas formed therein, such air or gas penetrating the oil in innumerable small streams or jets. The scum which rises to the surface is then removed, and the agitating process is repeated, the fresh scum being removed between each agitation. At the last agitation, a small quantity of water is added, so that the oil becomes thoroughly mixed with air and water. The sulpho-fatty acids are then destroyed, and the sulphuric acid is drawn off, and the impurities removed by washing the oil in hot water or by steam. The oil is now dried over a fire, or by steam heat, and is afterwards cooled by any suitable refrigerator, when it will be found to be perfectly pure and ready for the market. *Patent completed.*

1441. R. A. BOYD. *Improvements in the manufacture of bacon.* Dated May 13, 1862.

Here the inventor prepares the carcases of pigs for making them into bacon, by first removing the bristles, by passing them through heated water or steam, and afterwards scorching the skins by the action of flame or heat, in a stove or otherwise. *Patent abandoned.*

1442. J. SWENWRIGHT. *Improvements in the manufacture of polished plate-glass.* Dated May 13, 1862.

This consists in using for rolling out the glass a table which is not smooth, but has shallow ribs on its face; or a roller which, in place of being smooth, has similar projections on its surface. These projections may be either simple bands round the roller, or in the form of a spiral from end to end. These projections indent the glass, and it results that the sheet, on cooling, has a comparatively even face. The annealing, grinding, and polishing, is afterwards conducted in the ordinary way. *Patent abandoned.*

1443. W. CLARK. *Improvements in apparatus for generating motion in fluids, applicable for raising and forcing water, propelling and otherwise, in the distribution of motive power.* (A communication). Dated May 13, 1862.

This relates to hydraulic apparatus, in which steam is received in a fluid chamber, and by it separated from the water, its condensation being also prevented, while at the same time it is reduced for transmitting movement to the liquid, by utilizing the expansion of the steam for raising columns of water in motion. *Patent completed.*

1444. W. HARTICAN. *Improvements in fire-escape apparatus.* Dated May 13, 1862.

This consists, 1, Of an iron framing, which fixes on the lower part of the window. This framing is formed of two cramp-like parts, between which are stretchers or bars holding them in position. These cramps embrace the substance of the wall at the lower part of the window, and have on the inside projections to take under the beading or projections inside the window. These projections may be adjustible, and fixed by screws or otherwise. On the outside ends of the cramps are screws that take under the sill, and by turning which the whole framing is fixed rigidly in position. To the framing or outside ends of the cramps, are fixed two ropes, of sufficient length, so that, hanging down, they may properly reach the ground, and extend to the opposite side of a street. Between these ropes is fitted a canvass bag, suitable for persons getting into. It runs on the two ropes by thimbles fixed thereto, the bag being roped, and the thimbles being distributed throughout its length on each side. Two small blocks or pullies are appended to the iron framework before named, over which are rove two small ropes or lines, the one end of each rope being fastened to the bag, and the other leading down to the ground. By these lines the bag can be hauled up and down the standing, or inclined ropes, and persons so lowered from the window. *Patent abandoned.*

1445. R. A. BROOMAN. *An improved means or apparatus for shunting trains.* (A communication.) Dated May 13, 1862.

The object of this invention is to enable a train to be shunted or moved from one line of rails to another, without the aid of an attendant. The invention consists in fitting to the front or side of locomotives, tenders, or carriages in front of a train, a projecting rod or rods, which comes or come in contact with a weighted lever or levers on the rail, and which, through the medium of rods or chains, draw the points together, and cause the course of the train to be diverted. *Patent abandoned.*

1446. R. A. BROOMAN. *Improvements in louvre blinds or shutters.* (A communication.) Dated May 13, 1862.

This invention consists in forming the blinds entirely of iron, or with wooden frames and iron slots, as hereafter described. The frames are formed of iron uprights united at top, bottom, and about the centre, by cross bars; or the frames may be made of wood, lined with metal. The slots carry a pivot at each end, which pivots are received in holes made for their reception in the uprights—connecting pieces unite all the slots to an upright bar at the back of the blind. This bar is furnished with a handle, and has notches formed in it; the handle is for the purpose of altering the inclination of the slots, and the notches receive a pawl or rod for the purpose of maintaining the slots at the angle desired. In some cases the slots are fixtures, being connected by screws at their ends. The fastening for opening and closing the blinds consists of two bars which carry at their inner ends, at or about the centre, a link connected by a pin to a cross bar in the shaft of a handle. By turning the cross bar in one direction the bars are drawn inwards and released from their lodgments in the window sills at top and bottom, while in turning the cross bar in the contrary direction they are thrust outwards and are made to engage in their lodgments and thus lock the blind. *Patent abandoned.*

1447. W. SOUTHWOOD. *Improvements in machinery for manufacturing nails from either hot or cold bars of iron or other metal.* Dated May 13, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1448. R. M. LATHAM. *Improvements in steering apparatus.* (A communication.) Dated May 13, 1862.

This invention is carried into effect as follows:—To the steering wheel is adjusted a spindle supported upon proper bearings, upon which spindle is a vertical pinion gearing into a horizontal wheel attached to an upright shaft to be secured to the deck, and to this shaft the patentee attaches a wheel which gears into a quadrant; this quadrant is secured to a proper attachment, the latter embracing the rudder head, which attachment and quadrant he prefers should be in one casting. The lower part of the attachment which encircles the rudder head fits into a ring or socket, which has a flange intended to be secured to the deck. The ring and attachment where they come into contact should be placed to prevent friction. The wheel which gears with the quadrant should be of such depth, that it will allow the rudder to rise moderately, without any danger of throwing the apparatus out of gear. *Patent completed.*

1449. M. HENRY. *An improvement in, or addition to, gloves.* (A communication.) Dated May 13, 1862.

Here the glove is formed with a band or strip intended to lie around or near the wrist, and manufactured of soft kid. The further edge of the band or strip is angular or curved, in a direction away from or outward of the glove; when the glove is on the hand, the angle, or the outermost point of the curve, generally lies towards or over the centre of the wrist or cuff, or farthest from the glove. *Patent abandoned.*

1450. C. T. PORTER. *Improvements in steam indicators.* (A communication.) Dated May 14, 1862.

This consists in the use of a lever or its equivalent, so connected with the pencil and the piston as to give to the pencil a range of motion greater than that of the piston, in combination with a system of levers, or an equivalent therefor, so as to arrange the pencil point to travel in a straight line, substantially as described. *Patent completed.*

1451. H. C. R. JOUBERT. *Raising a music chair, stool, or seat, which entirely supersedes the original screw now in use.* Dated May 14, 1862.

This consists of a music chair, stool, or seat, rising to any height required, by vertical saw teeth racks fixed to the seat, and having in the lower frame a catch to each rack; by pressing a knob the catches open, and thereby allow the person to adjust the seat to any height required. *Patent abandoned.*

1452. F. TOLHAUSEN. *Improvements in the manufacture of velvets.* (A communication.) Dated May 14, 1862.

The loom the inventor uses for double-faced velvets resembles that now in use for the said fabric, but he arranges it so that, instead of there being only two ground warps or pieces one above the other, there are three one above the other. He uses two pile warps and two knives. In this manner he obtains three textures of fabrics one above the other, and, the pile being cut by the two knives, the result will be a double-faced velvet fabric in the middle, and one single-faced velvet above and beneath. Three shuttles are used, instead of two, and in order to overcome the difficulty that would have to be experienced in picking these shuttles simultaneously, he provides the two ground warp heddles, or healds, with three eyes each, and the pile heddle with two eyes, a proper shed being thus ensured for the easy passage of the shuttles. *Patent abandoned.*

1453. R. A. BROOMAN. *An improved method and apparatus for the production of photographic and stereoscopic portraits and pictures.* (A communication.) Dated May 14, 1862.

This invention consists—1, In the construction and employment of instruments containing lenses capable of producing portraits or pictures distorted in length, breadth, and obliquity, whether from the person or object, or from engravings, prints, or other representations. 2, In the production of a new style of photographic portrait, distorted in length, breadth, and obliquity, possessing all the clearness of an ordinary portrait. 3, In the application of these portraits to the stereoscope. 4, In uniting and combining a pair of distorted portraits, according to the plan adopted for stereoscopic pictures, reciprocally taken at the desired angles, all as described. *Patent completed.*

1454. J. W. GIRDLESTONE. *Improvements in projectiles.* Dated May 14, 1862.

Here the inventor encases the shot or projectile for rifled ordnance or firearms in a jacket of wood or papier maché, so that the jacket fits the bore, and being urged against the wedge-shaped rear of the ball, which is at first not quite home in the jacket, by the explosion is expanded into the grooves of the bore. The jacket receives a rotary motion from the grooves, and imparts the motion to the projectile by means of a projection on the jacket and recess in the projectile, or *vice versa*. The jacket falls off or comes to pieces after it has left the gun, this operation being sometimes facilitated by longitudinal saw cuts, extending from the front towards the rear. The jacket may have annular or cellular recesses, so as to reduce the friction and diminish the weight, and to strengthen the rear a plate of metal or other resisting material; and where shot for rifled or smooth advance is to be used against armour plates, the head or striking part of the projectile may be made slightly concave to improve its penetrating powers. *Patent abandoned.*

1455. H. DEACON. *Improvements in the manufacture and production of certain colours and in the apparatus employed therein.* Dated May 14, 1862.

The patentee claims, 1, The general system or mode of manufacturing or producing colours, and the construction, arrangement, and combination of apparatus used therein, as described. 2, The application and use to, and in the manufacture or production of, the said colours of retorts, ovens, or furnaces, so constructed as to admit of their contents being inspected, stirred, or otherwise manipulated without injury from the admission of atmospheric air. 3, The application and use to, and in the primary heating process in, the manufacturing or production of, the said colour of close or blind furnaces, or ovens, similar to those used in the manufacture of alkali for roasting salt cake or sulphate of soda. 4, The washing of the said colours in what are known as circulating vats or tanks, similar in principle to those employed in the manufacture of alkali for the lixiviation of black ash. *Patent completed.*

1456. A. SMITH. *Improvements in balances for weighing letters and other documents.* Dated May 14, 1862.

These balances are arranged for indicating the weight of articles suspended thereto without the aid of loose weights, and are constructed upon a principle which is somewhat analagous to that of the common steel-yard balance. Under the improved form of this invention, however, the fulcrum or points of support upon which the bar is balanced is moveable, and the bar or lever is graduated from its inferior to its superior end, the former being enlarged to act as a counterpoise, and the latter being fitted with a looped or other holder or scale for receiving the letter or other article to be weighed. The moving fulcrum is traversed along the bar to the centre of gravity, when the graduation thread indicates the weight. *Patent completed.*

1457. E. WHITTAKER and J. CLARE. *Improvements in machinery or apparatus for preparing cotton or other fibrous materials to be spun.* Dated May 14, 1862.

In the machines commonly known as the opener, or scutcher and beater, the patentee uses revolving rollers instead of the ordinary fixed grate bars or grid, through which the dirt or refuse passes. The said rollers are plain, grooved, or notched, or have a screw thread formed in them, and are placed either in a longitudinal, transverse, or diagonal position, and have, when required, motion given to them in any convenient manner, either by hand or power. *Patent completed.*

1458. H. G. DELVIGNE. *Improvements in fire-arms.* Dated May 14, 1862.

In this improved construction of pistol the inventor dispenses with the usual trigger, and substitutes a small rod inserted in a passage or channel in a metal bracket, which occupies the position of the ordinary trigger guard. By pressing against the front end of the rod with the forefinger, the rod is made to slide in the passage, and its hind end is thereby caused to act on the lock and discharge the

pistol. On the finger being removed, the rod is returned to its first position by a coiled spring. The second part of the invention relates to breech-loading arms for discharging several projectiles simultaneously through a number of barrels combined so as to form one, or through bores or channels in the same barrel. The barrels terminate in a breech-piece to which the stock is connected by a short screw, through the centre whereof is formed a touchhole, which, when the movable charge cylinder has been inserted in its place, communicates with the central chamber of that cylinder. *Patent abandoned.*

1459. J. SMITH. *Improvements in thrashing machines.* Dated May 14, 1862.

The patentee claims, 1, The employing of a current of artificially heated air obtained from the steam engine which drives the thrashing machine, or other source for winnowing the grain as it passes over the riddles and falls from riddle to riddle. 2, Subjecting the grain, as it passes from one part of the machine to another, to a current of artificially heated air continuously, or at various stages of its passages. 3, Causing the grain, as it passes from one part of a thrashing machine to another, to pass through a passage surrounded by a steam jacket heated by steam pipes or cases connected by shuttle pipes with the boiler of the engine which drives the thrashing machine. *Patent completed.*

1460. J. C. BRANT. *Improvements in the construction of armour plated ships, and in cements or compositions, or uniting iron to iron, and for uniting other substances, which compositions may also be used for caulking and for coating ships' bottoms.* Dated May 14, 1862.

In manufacturing cement according to this invention the inventor combines manganese or magnetic oxide of iron with oil of turpentine, or any other essential oil, and adds to it Swedish or other pitch and gutta-percha—resins and resinous gums, may also be added. The improvements in armour coated ships consist in preventing water from getting between the armour plates and the outer skin of the vessel by uniting the back of the armour plates to the skin by the cement above described. The invention also consists in placing a layer of cork, or a layer of lead, or a layer of cork together with a layer of lead, between the skin of the vessel and the back of the armour plates. *Patent abandoned.*

1461. A. NICOLE. *Improvements in stop watches and timekeepers, and in instruments for measuring accurately short intervals of time.* Dated May 14, 1862.

This invention consists in so arranging the above, that by pressure on a detent, an extra second's hand may be caused to start from a zero point on the dial, and may continue to run, marking seconds and fractions thereof, until the same detent is again pressed on, when the extra second's hand is stopped, and so remains until the detent is a third time pressed on, when it flies back to the zero point from which it started. The patentee also, according to this invention, mounts the extra second's hand, having the power of starting, stopping, and flying back to zero, as above mentioned, on a separate axis from that which carries the ordinary second's hands, and at a distance therefrom, by which means he is enabled conveniently to bring the extra second's hand to the centre of the watch, whilst at the same time the extra second's hand and its mechanism, when out of action, can be entirely separated from the moving parts of the watch, thus avoiding an increase of friction which would otherwise result.

1462. J. FLETCHER and J. W. FULLER. *Improvements in machinery for rolling, bending, and planing tools.* Dated May 15, 1862.

The first part of this invention consists in the application of hydraulic pressure for forcing up and drawing back the squeezing or nipping rolls of machinery for rolling tyres, hoops, and other circles of steel, iron, or other metal. The second part of the invention consists of an improved combination of machinery for bending armour or other strong metal plates. The third part of the invention consists in the application of friction cones or other friction apparatus for driving planing machines. *Patent abandoned.*

1463. T. H. C. MESURIER. *Improvements in raising sunken vessels and other heavy bodies.* Dated May 15, 1862.

This invention consists in the employment for that purpose of one or more cylindrical or other shaped closed vessels, divided internally so as to leave an air space or chamber at each end. The central portion of these vessels is perforated to allow water to enter freely therein when submerged, and is provided with a flexible or other air-pipe which serves the purpose of allowing the escape of the air from the water space of the cylinders whilst they are filling, and of allowing air to be forced therein in order to expel the water when the cylinders have been properly secured to the sunken vessel or other body. These cylinders are guided down to their proper positions by cords which are secured at their lower ends to iron balls attached to lengths of chain secured to the vessel, whilst the upper ends of the cords are supported by buoys or floats. Tubular passages are made transversely in a vertical direction through the cylinders, through which passages the cords are passed, so that the cylinders are guided to the sunken vessel as they descend. The tubes are made large enough to allow the balls to pass, but so soon as they have passed through, suitable hinged catches on the upper ends of the tubes close and prevent the cylinder from rising again, except with the balls and chains attached to the vessel, the attachment of the cylinders being thus self-acting. The air chambers at each end of the cylinder serve to check the rapid descent of the cylinders, and tend to keep the cylinders horizontal. Suitable bent pipes are fitted to the lower side of the cylinder opening into each end of the water chambers, for the purpose of enabling the whole of the water to be forced out in case the cylinder should be attached to the vessel in an inclined position. *Patent abandoned.*

1464. G. H. SANBORN. *Improvements in machinery for spinning.* (A communication.) Dated May 15, 1862.

The object of these improvements is to increase the rapidity with which yarns have hitherto been twisted by machinery, to decrease the required power, to arrange the different parts of the spinning machines in the least possible space, and to easily regulate the number of twists in a given measure of yarn, for the purpose of more perfectly adapting it to various purposes, and for the manufacture of different fabrics. The chief peculiarity of the invention consists in the employment of two or more reels or "flyers" arranged in succession one within another, the inner flyer or flyers being so geared as to revolve in the same or opposite directions to the outside one, and at the same or different rates of speed from the said outside flyer, as may be desired, for the purpose of obtaining different degrees of twist in the yarn. *Patent abandoned.*

1465. R. WALSHAM and J. WALSHAM. *A new or improved sleeve tie or fastener.* Dated May 15, 1862.

To each end of a piece of elastic webbing of rather more than an inch long the inventors attach a metallic hook, one of the said hooks having a loop fixed to it, into which loop the other hook may be inserted at pleasure. In using this sleeve tie or fastener, the elastic webbing is passed under the sleeve, and the hook on one end of the webbing being made to engage with the loop on the other hook, the sleeve is gathered up and secured on or near the shoulder. On removing the hook from the loop, the sleeve is loosed, and the sleeve tie or fastener may be removed. *Patent abandoned.*

1466. J. P. JOUVEN. *An improved process for preserving iron-plated and other vessels and metallic articles from oxidation, and preventing ships' bottoms from fouling.* Dated May 15, 1862.

The patentee claims, 1, The applying, and the mode of applying, to the interior surface of iron and iron-plated ships, zinc sheets, either alone or together with metallic paint or felt, sprinkled with metallic zinc powder, to preserve iron-plated and other ships from the destructive action of sea-water, as described. 2, The production of a poisonous compound, and its application to the bottoms of iron and iron-plated ships, and to wood used to construct dikes, embankments, docks, and for naval and other similar constructions, in order to prevent for the former the deposit of barnacles and seaweeds, and to protect the latter from injury from teredos, as described. 3, The application to parts of iron ships, and to iron articles, of a paint having pulverized metallic zinc for base, applicable as a substitute for red lead paint, as described. 4, The application of sheets of zinc, or metallic zinc paint, to the exterior of sheet iron tanks, marine boilers, steam engines, and other like articles, and the application of bands of zinc to parts of cables and chains, as described. 5. The application to the hulls of copper-sheathed wooden vessels of protecting paint, which, for economy, may be made with cast iron, or iron powder, instead of zinc powder, as described. *Patent completed.*

1467. J. DICKER. *Improvements in apparatus for the delivery of bags or parcels from railway trains in motion.* Dated May 15, 1862.

This invention is carried into effect as follows:—To the near side of the railway carriage is attached one or more projecting arms, from which the bag or parcel to be delivered is suspended. When the bag or parcels have been delivered, these projecting arms are drawn up close against the side of the carriage, by means of a counterbalance weight inside. At the corresponding side of the railway there is erected an upright receiving standard and framework, furnished with diverging lines, to disengage the bag or parcel from the projecting arm; as soon as the bag or parcel leaves the projecting arm it is received upon an inclined platform, which conducts it down behind the standard clear of the rails. Any required number of bags or parcels can in this way be delivered at a station from railway trains while they are in motion. *Patent completed.*

1468. W. SISSONS. *Improvements in machinery for driving piles by means of steam hammers.* Dated May 15, 1862.

This invention consists of an improved description of catch for lifting and releasing the hammer, to allow it to fall upon and drive the pile into the ground. And, also, in the application thereof, in conjunction with the improved arrangement of steam power, to the hand piling machine, and, likewise, the combination of a steam-engine, with framing, moveable platform, chain and catch, for the purpose of pile driving. The invention cannot be described in detail without reference to the drawings. *Patent completed.*

1469. G. H. BIRKBECK. *Improvements in apparatus for consuming smoke.* (A communication). Dated May 15, 1862.

For the purpose of this invention, the grate or fire-bar surface is formed with a hollow or recess, by preference of a curved or concave form; but it may be of conical or pyramidal, or other suitable shape, if desired, commencing from and in the "dead plate," and inclined from the front upwards, towards the back of the furnace, or fire-place. This hollow channel or passage is prolonged outwards, from the front of the furnace, forming a conduit or conductor, and it is furnished with a receptacle, made of sheet iron, which receives and retains the fuel till required to supply the fire, the fuel being fed or pushed forward therein, and fed into the furnace by means of a piston, actuated by a screw or otherwise. The unignited fuel, as it is forced forward into the furnace, is caused to pass underneath the ignited or incandescent fuel, and as the smoke and gases are generated, they become ignited, and are consumed, the fuel, by the hollow or recess being conical, or inclined, is gradually distributed over the surface of the fire-bars. In large furnaces, two or more feeding channels or passages, and apparatus to force and conduct the fuel into the furnace, may be employed if required. *Patent completed.*

1470. J. STONE. *Improvements in Downton's ships' bilge pumps and fire-engines.* Dated May 15, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1471. J. WRIGHT. *An improved rotative travelling crane.* (A communication). Dated May 15, 1862.

Provisional protection has not been allowed for this invention.

1472. J. WRIGHT. *Improvements in machinery for digging, excavating, and removing earth, gravel, and such like substances.* (A communication.) Dated May 15, 1862.

This invention consists in an improved form of excavator, to be worked by steam or air, and which is capable of being moved on rails near the ground to be excavated, and which removes the dirt, stones, gravel, and such matters to any distance that may be required. The patentee places on a suitable frame, and mounted on wheels, a boiler and engine. This engine drives a toothed wheel, which gives motion to another similar wheel, on whose axle is a square frame, over which passes an endless chain of links, carrying a series of buckets or scoops; each bucket or scoop is preceded by a coulter or knife, for penetrating and loosening the earth or soil, which is then scraped up by the scoop or bucket. The endless chain carrying these buckets is kept at the required tension by a pole, which can be raised or lowered by means of cords and pulleys on the frame of the machine. On the axle of the first-mentioned toothed wheel is an endless band, passing round and kept tight by a tension pole or rod, similar to the one before named; this pole may be of any length, and can be raised or lowered as wished. The action is as follows:—Motion being given to the toothed wheel carrying the square on which is the endless chain of buckets, these are lowered to the required depth, and sink by their own weight into the ground; these buckets are open on the side next the chain, and, when in action, are kept close against it; but when they come over the pulley, they turn over by their own weight, and discharge their contents on the endless table before mentioned, which removes it into a truck. This machine can be moved in any direction on rails, and when placed on a boat it serves as a dredging machine, with the advantage of raising the mud without disturbing the bottom. *Patent completed.*

1473. C. ATTWOOD. *Improvements in the production or manufacture of steel and iron of a steely quality.* Dated May 15, 1862.

This invention essentially consists in the production of steel and of iron of a quality approximate to steel, which may be called steely iron, simply by bringing into a state of liquefaction by means of heat a mixture of malleable iron of such kinds as in themselves are capable of producing good serviceable steel and steely iron, and of a certain kind or kinds of non-malleable or crude cast iron, such, for instance, as are usually called spiegal risen, which are also by their own nature capable of being made into good and serviceable steel in certain proportions to each other (as specified), by which mixture and liquefaction of those materials hard steel, or soft steel, or steely iron, are respectively produced, according to the different proportions in which such two several materials or ingredients may be severally employed, such proportions also requiring to be varied according to the difference in their quality in respect of the greater quantity of carbon contained in each, and to their greater or less tendency in consequence thereof, to make such steel or steely iron of harder or softer quality. *Patent completed.*

1474. C. TRESS. *Improvements in the manufacture of hats, helmets, bonnets, or caps.* Dated May 15, 1862.

This invention consists in a method of constructing the above-named articles whereby currents of air may readily pass from the exterior to the interior thereof, an air chamber, cells, or cavities being formed therein above and surrounding the head of the wearer, in order to ventilate and keep the head or interior cool in hot weather, or tropical climates, and where else required. *Patent completed.*

1475. J. BAGGS and W. SIMPSON. *Improvements in treating straw, Spanish grass, and other vegetable fibres in preparing a bleaching agent for vegetable fibres, and in recovering and treating an alkali resulting from the treatment of the said fibres, and in apparatuses employed therein.* Dated May 15, 1862.

This invention consists, 1, in removing the silex from straw, Spanish grass, and other vegetable fibres, by means of hydrofluoric acid, either in a liquid form, or in the form of gas. The patentees construct an apparatus or vessel in which the fibres are subjected to the action of the gas as follows:—They take a cylinder formed with screw vanes or blades on the interior thereof, and carry a perforated pipe through the centre; this pipe is in communication at one end with the gas supply, and also with an air pipe, through which air is forced by a fan or otherwise. The straw or other fibre is fed in by a tilting rake or other like contrivance at one end of the cylinder, which, being caused to revolve, carries the fibres gradually along, and finally out at the opposite end. 2, In the partial recovery of the alkali from the liquor in which the straw or other fibre has been boiled by means of steam or hot water. 3, In the distillation of the residuum after boiling and evaporation in a close retort, whereby they obtain a gas fit for illuminating purposes. 4, In manufacturing chlorine for bleaching the said fibres and others, as follows: They take two separate vessels, one of which (say in the form of a retort) contains substances from which muriatic acid gas is generated, while the other contains the materials which decompose the muriatic acid and give off chlorine. They prefer to mount this second vessel upon trunnions. The gas is led from the first into the second vessel; and the chlorine evolved in the second vessel is led into a third vessel containing water, or water and lime, or other base and an agitator. The chlorine is absorbed, and a bleaching liquid obtained. *Patent completed.*

1476. C. GIRARDET. *An improved construction of buckle.* Dated May 15, 1862

Instead of forming this buckle with a tongue hinged to the buckle frame, the inventor uses the ends of the frame as parallel guides to receive an open sliding frame, the nip of which serves to hold the free end of the strap in position. One bar of the sliding frame is pierced to allow of the ordinary prongs (which are carried by one of the side bars of the buckle frame) projecting therein, and offering no obstruction to the sliding of the inner frame on its guides. The free end of the strap intended to be secured is passed

through the sliding frame, and that frame is then moved forward until the fixed prongs enter the fabric of which the strap or band is composed. The strap will thus be held fast, and any drag put upon it will tend to increase the security of the buckle. *Patent abandoned.*

1477. A. WATNEY. *Improvements in constructing ships, vessels, and other structures intended to resist shot.* Dated May 16, 1862.

According to this invention, the patentee forms the side of a ship or vessel intended to resist shot in the following manner:—He builds up the structure of a series of iron (or it may be steel) plates, which may be of any convenient length and thickness; it is preferred, however, that the latter should not be great. These plates he lays one on the other, so that their edges only are exposed, and he annexes each plate by means of rivets to the plates in contact with it on either side. One half of the rivets which pass through each plate, are for the purpose of connecting it to the plates on one side, and the remainder to those on the other side of it. Each plate is prepared by punching a number of rivet holes through it, and these holes are countersunk, one half on one side of the plate, and the other half on the other. The holes in all the plates are accurately placed, so that they may correspond the one with the other. Each plate, before it is attached to the portion of the work already completed, has one half of the holes in it filled by rivets placed through them; the heads of these rivets all lie in the countersunk holes on one side of the plate, and the ends of the rivets project out from the plate on the other side. The plate with the rivets in it is then applied to the already finished portion of the work, the side from which the ends of the rivets project being outwards. From the side of the already finished work, the ends of rivets project, and these, when an additional plate is applied, pass through the previously unoccupied holes in the plates, and the plate is then secured by clenching these ends over the plate. The ends of the rivets placed through the plate previous to its application to the work, then project from it to receive other plates in a similar manner. The plates are arranged so as to break joint the one with the other. *Patent completed.*

1478. P. M. PARSONS. *Improvements in ordnance and other fire-arms, and in tools for rifling the same.* Dated May 16, 1862.

In carrying out one portion of this invention, the inventor forms the main portion of the gun of cast iron, but instead of casting it solid, or with a solid breech, as usual, he casts it with the bore right through; and he employs a hollow pipe encased in loam, or other suitable substance, to form the core, through which a stream of water is made to flow, while the gun is being cast, and during the time it is cooling. He then bores out a conical recess at the breech end of the gun, larger in diameter than the intended finished size of the bore, but extending only a portion of its length, and he fits into the recess a tube of wrought iron, steel, homogeneous metal, or other suitable material, accurately turned to the shape and size of the conical recess, which forces in, and secures by a breech plug screwed into the breech of the gun, in the case of muzzle loading guns, or by a nut or hollow screw in the case of breech loaders. The tube may be in one piece of metal, or built up of several, either by fitting two or more rings together, or by shrinking or forcing one or more tubes or rings on to an inner tube or tubes. He also applies the conical tube in the manner hereinbefore described to guns cast solid, or with an ordinary or solid metal core, as well as to guns already made for the purpose of strengthening them, and, in some cases, he applies the conical tube in combination with a tube of wrought iron, steel, homogeneous metal, or other suitable material with which the gun is lined throughout the whole length of the bore. *Patent abandoned.*

1479. J. RAILTON and T. RAILTON. *Improvements in warping machines.* Dated May 16, 1862.

The object of these improvements is to stop the warping machine instantly when one of the warp threads break. In order to accomplish this, the inventors apply the following self-acting apparatus to the warping machine:—Each warp thread is taken over a balanced lever, and these levers are hinged to a cross shaft, and they are guided by the dents of two open reeds; these parts are mounted on a vibrating frame, to which a link connected to the usual spring starting lever is pointed; under the weighted end of the balanced levers a rocking bar is moved to and fro by the warp beam or other convenient part of the machine. When the warp threads are all passing forward to the warp beam, the balanced levers are held clear of the rocking bar, but the moment a thread breaks. the balanced lever over which it was passing, drops, and the rocking bar coming in contact with it moves the vibrating frame, thereby liberating the spring starting lever from its retaining catch, and moving the driving strap from the fast to the loose pulley. *Patent abandoned.*

1480. G. HASELTINE. *Improvements in churns.* (A communication.) Dated May 16, 1862.

This invention relates to a novel construction of the dasher or plunger, and to a peculiar mode of operating the same. The body of the churn is made of any desirable material, form, and size. The dasher is constructed of wood of any form suited to the body of the churn in which it is to be used. It consists of an upright bar or standard, attached at its lower end to a main horizontal bar, to each end of which a transverse horizontal bar is fixed at right angles to the said main bar. On the under and inner sides of the transverse bars each side of the main bar shoulders are cut. These shoulders receive and arrest the upward movement of the wings or dashers hereinafter described. These wings or dashers are perforated to admit the passage of the milk or cream, and are attached by means of projections formed on the ends and at the sides next the main bar, which extends into holes bored in the transverse bars. These projections keep the dasher boards in position, and perform the office of hinges, allowing the dasher boards or wings to swing down as the dasher is raised up, until they are arrested by a bevelled block at an inclination of about 45°. This block is fixed to the main bar, the bevelled ends extending beyond the said bar, and over the dasher boards. The dasher is operated by means of a lever or handle attached to, and resting upon, the upright bar or standard. The end opposite to that at which the power is applied is fixed to a post outside the body of the churn, the lower end of the said post resting on a cleat fastened near the bottom of the said body, and diverging therefrom, being kept firm in its position by means of a brace running out from the churn. *Patent completed.*

1481. R. FENNER. *Improved machinery for folding envelopes.* Dated May 16, 1862.

In carrying out this invention the inventor places separate letters or figures made of iron, steel, brass, or other suitable metal, and forming the pattern to be embossed in due order upon a surface of iron or other sufficiently hard and strong material, and fills it in with wax or other similar plastic substance. He then lays the metal plate to be embossed upon these letters or figures, covering the surface not coming in contact with the characters with vulcanized india-rubber or other suitable material, and by the application of sufficient pressure produces a copy of the pattern in embossed or raised letters or figures. *Patent abandoned.*

1482. R. LAMING. *Improvements in constructing and using electric telegraphs.* Dated May 16, 1862.

The patentee claims as his invention, with respect to the electric telegraph generally, the adjustments of its parts to one another, as described, and also using either or both ends of a telegraph with its parts so adjusted in the way specified, or with such modifications as may embody his invention; but he does not claim the simple application of the opposite poles of two batteries at the two ends of a line, when unaccompanied with the adjustments to the wire of the voltaic elements and of the coils of instruments, opposite poles having already been so applied, though for a different purpose. And, with respect to marine electric telegraphs in particular, he claims the constructing and using of subaqueous telegraph cables with conductors immediately surrounded by insulators of dried organic materials in a fibrous condition, saturated with insulating cements. Also constructing and using subaqueous telegraph cables in which the insulation and the tensile strength are conferred, either wholly or in part, by dry organic materials used in a fibrous condition. Also the application and use of tubes and caoutchouc and of lead, and of servings of vulcanized caoutchouc, and of other coverings that are sufficiently impervious to water for keeping dry insulators of subaqueous telegraph cables composed of dried hemp and insulating cements, and that depend for their efficiency upon an artificial dessication, which perhaps they might not otherwise so perfectly maintain. *Patent abandoned.*

1483. C. BINKS. *Improved method of, and apparatus for, treating linseed and other oils and fats.* Dated May 16, 1862.

We cannot here devote space to the voluminous details of this invention. *Patent abandoned.*

1484. A. A. LAMIABLE. *Improvements in cementing cast and wrought-iron, to obtain cast steel.* Dated May 16, 1862.

The patentee claims, 1, The application of wood, divided into small parts, such as saw-dust, the leaves of trees, and the envelopes of certain fruits, for the cementation of juices of cast or forged iron, to form steel suitable for the manufacture of cutlery, rails, tyres of wheels, and other articles, as described. 2, The mode of converting the steel of cementation into cast-steel, as described. *Patent completed.*

1485. A. L. THIRION. *Improvements in the construction of railway and other carriages.* Dated May 16, 1862.

This invention consists in removing or relieving the axle from the direct weight of the carriage, and receiving it on metallic balls or bodies of a spherical or conical form, revolving between the plates or discs, which metallic balls or cones do not touch the axle; and in the mechanical contrivances or arrangements by which this object may be advantageously attained. *Patent completed.*

1486. F. B. ANDERSON. *Improvements in watches, and other time-keepers.* Dated May 16, 1862.

The object of this invention is to obtain a maintaining power with a fixed barrel, whereby the chain, and many parts in watches as now made, are dispensed with, and other advantages are gained. The patentee forms the barrel, and barrel-bar, or name plate, in one piece, and he also forms the ratchet, great wheel, and barrel arbor in one piece. He places in the barrel a collar or nut, with a square space in the centre, to fit the square of the spindle of the arbor, and he forms a hook on the outer surface of the nut, to take hold of one end of the spring contained in the barrel, the other end of which is fixed to the side of the barrel. He also forms the side of the barrel with apertures for the reception of the hook or stud, which holds the outer end of the spring, in order that the hook or stud may be shifted from one to the other, so that the tension of the spring may be regulated. The tension of the spring may also be regulated by shifting the collar to which the inner end of the spring is attached on the arbor. Again, in some cases, he makes the barrel and upper plate in one. *Patent completed.*

1487. D. C. LE SOUEFF. *Improvements in embossing metal plates.* (A communication.) Dated May 16, 1862.

This apparatus consists of a plunger working in a folding box, and attached to a suitable can by means of a rod; attached to this rod are various arms, which respectively actuate levers attached to the gumming plunger, the stamping plunger, the lever for opening the folding box, and the feeding carriage; in the interior of the folding box are weighted bell crank levers for enabling the flaps of the envelopes to be folded after the first descent of the plunger. *Patent abandoned.*

1488. G. DAVIES. *Improvements in the manufacture of ribs for umbrellas and parasols, part of which is adapted to the hardening of strips of steel generally.* (A communication.) Dated May 16, 1862.

The first part of this invention consists in hardening the strips of steel wire for the ribs of umbrellas and parasols, by passing the said strips, while red-hot, at an uniform speed through a hole in a trough containing water, or other suitable fluid, a constant steam of the latter being allowed to pass through the said opening in contact with, and so as to surround the strips of, steel wire, as described. This portion of the invention is applicable to the hardening of strips of steel generally. The second part of the invention relates to the construction of the joints which connect the stretchers to the ribs of umbrellas or parasols, and consists of a metal block cast to each rib, and arranged for connection to the stretcher in the manner described, so as to form with the end of the stretcher a cheap and durable joint, without weakening the rib at the point where the greatest strength is required. The third part of the invention consists of metallic tips or knobs, cast to the steel ribs of umbrellas and parasols, as described, so as to avoid the sharp, exposed, and otherwise objectionable ends of the steel ribs, as hereinbefore constructed. *Patent completed.*

1489. S. PEBERDY. *Knitting ribbed fabrics.* Dated May 16, 1862.

This invention consists in knitting ribbed fabrics by means of bearded needles combined with shields or guards formed substantially as described. The object of the invention is to dispense with the cumbrous and complex mechanism which has heretofore been used in knitting machines for produced ribbed fabrics. *Patent abandoned.*

1490. N. AMES. *A new and useful self-feeding card printing press.* Dated May 16, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1491. N. THOMPSON. *Improvements in stoppers or covers suitable for closing bottles, jars, and other similar vessels.* Dated May 16, 1862.

Here the patentee uses a plate or lid of earthenware, or any suitable rigid material, and which may be either made to lie flat over the mouth of the vessel, or it may be made with a conical or straight projection to enter the mouth of the vessel, which may be also coned or made straight to receive it. In either case he introduces a ring of vulcanized india-rubber, or other elastic or soft material between the bearing surface of the stopper or cover and the mouth of the vessel. In order to press the lid or stopper downwards, and secure it to the bottom jar or vessel, he uses a screw and nut; these are fitted into a recess in the centre of the upper side of the lid; by turning the screw the nut can be traversed up and down vertically, the screw being kept from traversing independently of the cover by collars, which bear on the piece which carries it, and which is attached to the stopper or cover. The nut carries two, three, four, or other convenient number of arms which radiate from it; these lie in grooves acting in guides to prevent the arms turning in the upper surface of the lid, and the said arms have claws, pin jointed, or otherwise connected to them at their ends, which catch into projections on the neck, or around the mouth of the bottle, jar, or vessel. Thus, by turning the screw the claws are caused to draw the stopper or cover downwards, so as to make a perfectly air-tight joint between it and the mouth of the bottle, jar, or vessel. The projections on the neck or around the mouth of the bottle, &c., are by preference recessed or undercut, so that the claws cannot be removed from the projections until they are released by the screw. The screw is turned by a key fixed on a suitable knob or handle, and which enters a corresponding recess in the end of the screw. *Patent completed.*

1492. F. STOCKEN. *Improvements in carriages.* Dated May 16, 1862.

This consists in applying folding steps to carriages, in the following manner:—An opening is made through the side of the carriage, by preference into the boot, or that part of the carriage which is over the fore wheels. This opening is closed by a door or panel, hinged to it at its under side, and this panel can be turned down, so as to stand at right angles to the side of the carriage. The folding steps are connected to the upper part of the door or panel, and, when the panel is turned down, so as to be at a right angle to the side of the carriage, the steps may be turned down, and made to descend to any desired distance. When the steps are folded up, the door or panel may be closed, and the carriage have the appearance of an ordinary carriage. *Patent completed.*

1493. B. SHARPE. *Improvements in the construction of ships and vessels, and in masts and spars for the same.* Dated May 16, 1862.

In constructing ships and vessels, of which the framework is principally of wood, in order to give greater strength and security to the several pieces of timber which form the frame, and other parts of the ship, the patentee places on one, or on each side of each frame, or piece of timber, a plate of metal of corresponding form, and passing from one end to the other of the frame, or piece of timber, so as to cover all the joints, and he secures the plates of metal to the timber by bolts; these metal plates hold the pieces of timber securely in their places, whilst the timber serves to keep the metal plates from breaking. He prefers to keep the metal plates out of immediate contact with the wood, by interposing tarred felt, paper, or other material, and also the coating the iron with another metal, by the process termed galvanizing. In order to give additional strength to ships, he arranges the deck beams so as to form a series of hexagons, and equilateral triangles, or nearly so. He does not claim a mere diagonal arrangement of the beams, in separate courses, as has been heretofore practised, but that intimate relation of all parts to each other, as shown in the drawings. *Patent completed.*

1494. A. V. NEWTON. *Improved machinery applicable to the cutting of leather, and other like uses.* (A communication.) Dated May 16, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1495. A. V. NEWTON. *Improved machinery applicable*

to the cutting out of boot and shoe soles, and kindred operations. (A communication.) Dated May 16, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1496. C. BINKS. *Improved methods of obtaining oxygen and chlorine gases.* Dated May 17, 1862.

This consists, 1, In causing, by any convenient means, a mixture of hydrochloric acid gas and oxygen gas, or a mixture of hydrochloric acid gas and atmospheric air, or atmospheric air mixed with a larger proportion contained in atmospheric air in its natural condition, to be brought in contact with concentrated or strong sulphuric acid, either under ordinary temperatures higher than ordinary ones, in order to effect the decomposition of the hydraulic acid with the liberation of its chlorine in the form of gas. 2, In projecting into, or otherwise bringing in contact with, liquid hydraulic acid (by any convenient apparatus or appliances), strongly heated oxygen gas or atmospheric air, or a mixture thereof, in order to effect the decomposition of the acid, and liberation from it of gaseous chlorine. 3, In certain methods of effecting the well known reactions between gaseous hydrochloric acid and oxygen gas, when these reactions are applied in the production of chlorine. 4, The object of the invention is to facilitate and economise the production of oxygen gas, and consists, first, in projecting into, or otherwise bringing into contact with, water (by any suitable contrivances), chlorine gas strongly heated as to effect, on such contact, the decomposition of the water, the result of a combination between its hydrogen and the chlorine forming hydrochloric acid, which is retained by the excess of water present, and thus liberating its oxygen in the form of gas. *Patent abandoned.*

1497. R. W. SIEVIER. *Improvements in naval warfare.* Dated May 17, 1862.

This consists in the application of an independant battering ram or rams to vessels of war of any class. *Patent abandoned.*

1498. R. DAVIDSON and T. JOHNSON. *Improvements in machines for washing and cleaning casks.* Dated May 17, 1862.

This invention consists of an improved frame or holder for containing two, three, four, six, eight, or more casks, and for securing the same while being washed or cleansed by hot water, or gravel, or chains. The improved holder consists of an inner frame containing a central shaft, with a right and left screw thread cut thereon, working through two nuts on, or connected to, two discs or platforms, between which the casks in one, two, or more tiers are placed. The discs or platforms are caused to move towards and recede from each other always equidistant from the main axis, for the purpose of securing and releasing the casks by giving motion in one direction or the other to the threaded shaft through a hand wheel keyed on one end thereof, or by simply making the upright shaft a fixture, by means provided for this purpose, and then turning the inner frame to the right or to the left, as may be desired, by laying hold of bars forming part of the inner frame. The holder is mounted, and is free to revolve round its own axis in an outer frame, made to revolve round its own axis, which is at right angles to that of the holder, by which means the casks are made to revolve in two contrary directions at the same time. There are various means of imparting these compound motions. *Patent completed.*

PROVISIONAL PROTECTIONS.

Dated July 24, 1862.

2100. J. Leetch, gunmaker, St. Marylebone, and B. Mathew, gentleman, St. James', Middlesex. New and improved methods of protecting the surfaces of iron or other metal work from oxidation, incrustations, or accumulations of any kind, more especially in the cases of ships' bottoms, steam boilers, and machinery.

Dated Oct 30, 1862.

2926. H. Eastwood, Elland, York, machine maker. Improvements in boilers and furnaces.

Dated Nov. 1, 1862.

2957. G. Haseltine, 100, Fleet-street. Improvements in coffins or burial cases. (A communication.)

Dated Nov. 4, 1862.

2984. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in the manufacture of fringes and in machinery employed therein. (A communication.)

Dated Nov. 10, 1862.

3024. G. H. Sanborn, 99, Cheapside, merchant. An improved wringing machine.

Dated Nov. 13, 1862.

3056. T. C. and J. Eastwood, Marshall Mill, Bradford, York, machine wool combers. Improvements in machinery or apparatus for combing wool or other fibrous substances.

Dated Nov. 15, 1862.

3074. L. Croc, Aubusson, France, chemist. An improved ink to be used for the purposes of electric telegraphic printing or marking.

3076. J. Rimmer, Liverpool, coach builder. Improvements in hansom cabs.

3080. H. C. Whitburn, Orrell Colliery, Lancaster. An improved method of purifying sand to be used in the manufacture of glass, and for other purposes where silica is used.

Dated Nov. 17, 1862.

3090. C. Littleboy, Straffan, Kildare, Ireland, land steward. Improvements in implements for cultivating land.

Dated Nov. 18, 1862.

3092. J. Raphael, Upper Fountain-place, City-road, stick manufacturer. Improvements in umbrella, parasol, sunshade, and walking sticks.

3094. P. H. Klein, No 31, Rue du Grand Prieuré, Paris, engineer. Machinery for turning or shaping metals and other substances.

Dated Nov. 21, 1862.

3126. C. Hadfield, Hadfield, Derby, and W. A. Attkins. Improvements in compressing or dressing bricks and tiles and other materials, and in machinery or apparatus to be employed for such purposes.

3128. J. R. Napier, engineer and shipbuilder, and W. J. M. Rankine, civil engineer. Improvements in boilers, and valvular mechanism for steam engines.

3130. D. Saul, Swinton, Manchester, cotton spinner, and M. Morris, manager. Improvements in the manufacture of crinoline skirts, and in the apparatus employed therein.

3132. T. Walker, Birmingham, engineer. Improvements in utilizing sewage matters, and in the means or apparatus employed therein, part of which improvements is also applicable to raising and forcing other fluids.

3134. R. W. Swinburne, South Shields, soda manufacturer. Improvements in the manufacture of soda.

3136. J. Taylor, jun., Christchurch-road, Streatham. Improvements in the manufacture of tiles or moulded blocks for building purposes.

3138. S. Deacon, Alma-street, New North-road, builder, and C. Deacon, Rushton-street, St. John's-road. Improvements in tops, caps, and wind-guards for chimneys, and in apparatus for cleaning the same.

Dated Nov. 22, 1860.

3140. W. E. Gedge, 11, Wellington-street, Strand. An improved elliptical compass. (A communication).

3142. M. Mishores, Newcastle-street, Whitechapel. Improvements in the construction of handles for umbrella, parasol, or other like sticks from soft canes.

3144. C. Powell, Birmingham, watch manufacturer. Improvements in watches and other timekeepers.

3146. A. V. Newton, 66, Chancery-lane, mechanical draughtsman. Improvements in machinery for cutting corks. (A communication).

Dated Nov. 24, 1862.

3150. W. Clark, 53, Chancery-lane, engineer. Improvements in the means of obtaining a vacuum or partial vacuum, as applied in the manufacture of paper. (A communication.)

3154. E. Leigh, Manchester, mechanical engineer. Improvements in cotton gins.

3156. N. J. Amies, Manchester, smallware manufacturer. An improved fabric to be employed as a substitute for elastic, woven, or "braided" webs, and improvements in the method of manufacturing the same.

Dated Nov. 25, 1862.

3158. T. and L. Robertshaw, manufacturers, Bradford, Yorkshire. Improvements in the manufacture of textile fabrics, technically called "Moreens."

3164. G. Ranson, Eccleston, Lancaster, licensed victualler. Improvements in apparatus for preparing clay for brick-making and other purposes.

Dated Nov. 26, 1862.

3168. T. Fletcher, Rochdale, tin plate worker. Improvements in the construction of rollers, cans, spools, and bobbins, and in the machinery employed therein.

3170. J. Steinthal, Abbey Hey Works, Gorton, near Manchester, manufacturing chemist. An improved moulder's blacking.

Dated Nov. 27, 1862.

3178. F. W. Hartley, 55, Millbank-street, gas engineer. Improved means of obtaining certain products resulting from the manufacture and purification of coal gas. (A communication).

3180. W. T. Rowlett, Leicester. Improvements in machinery used in producing knit or looped fabrics.

3184. W. Clark, 53, Chancery-lane, engineer. Improvements in the preservation of animal and vegetable substances. (A communication).

INVENTION PROTECTED FOR SIX MONTHS BY A COMPLETE SPECIFICATION.

Dated Nov. 29, 1862.

3198. W. E. Gedge, 11, Wellington-street, Strand. Improvements in the construction of clocks or timekeepers. (A communication).

LIST OF SEALED PATENTS.

Sealed December 5, 1862.

1714. J. Lovegrove.
1721. F. Giachosa.
1726. J. Kinlock.
1729. G. T. Jourdain.
1730. H. C. Jennings.
1734. J. Shand.
1738. W. Holland.
1749. A. A. Serenard.
1759. J. H. Glew.
1811. E. J. Davis.
1818. J. Bedford.
1840. J. Lawson.
1859. M. A. F. Mennons.
1913. T. Parker.
1938. G. H. Birkbeck.
2623. H. Hutchinson.

Sealed December 9, 1862.

1736. J. D. Wake.
1737. H. Bland.
1739. W. Crook.
1744. B. W. Gerland.
1745. J. Hetherington.
1746. J. Ingham and W. P. Wood.
1752. A. Salviati.
1753. B. George.
1766. J. Robinson.
1768. T. Williams.
1762. J. Sawyer and G. Padgham.
1773. W. Bouch.
1774. R. A. Brooman.
1775. W. Wighton.
1779. J. F. Allan.
1782. W. J. Curtis.
1790. J. and T. Nield.
1834. S. Holman.
1841. E. Edmonds.
1847. W. Barr.
1867. E. H. Huch and F. J. Windhausen.
2167. W. Norman.
2492. G. T. Bousfield.
2494. G. T. Bousfield.
2620. P. Wright.
2789. E. A. Cowper.
2811. H. Ledger and B. Williamson.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

(From the *London Gazette.*)

2100. J. Leetch and B. Mathew. Protecting the surfaces of iron or other metal work from oxidation, incrustations, or accumulations of any kind.

2134. W. Maughan. Beverages.

2137. J. Fourdrinier. Removing knots from pulp.

2146. J. Mackenzie. Shaping machines.

2148. E. T. Hughes. Refining the slag from furnaces. (A communication.)

2150. J. Norris. Ovens.

2151. C. T. Burgess. Stand for casks.

2158. W. E. Gedge. Securing the safety of trains moving on railways. (A communication.)

2164. G. H. Birkbeck. Preserving timber. (A communication.)

2173. C. Bedells. Manufacture of braces.

2181. G. A. Biddell. Railway crossings.

2182. J. C. Onions. Portable forges.

2183. R. and D. Nurse. Annealing pot.

2188. T. Onion. Propellers.

2190. J. Gray. Cleaning ships' bottoms.

2191. E. B. Wilson and M. Picard. Manufacture of iron and steel.

2193. G. Coles, J. A. Jaques, and J. A. Fanshawe. Grinding and polishing tools and surfaces.

2218. R. W. Ralph. Reaping machines.

2236. G. T. Bousfield. Manufacture of hat bodies. (A communication.)

2247. J. Combe and J. H. Smallpage. Holding and receiving cops when used for warps or sewing thread, or other purposes.

2275. L. D. Verstraet and E. M. Olivier. Manufacturing carbonate of soda.

2323. S. Boucher. Spinning flax.

2327. W. Whittle. Nails and spikes.

2332. S. Wilkes. Attachment for door nobs.

2358. M. Henry. Stuffing boxes and packings. (A communication.)

2391. W. Husband. Water-valves.

2452. W. E. Bovill. Applying oil and other fluid lubricating matters to machinery. (A communication.)

2477. J. Webster. Steam boilers.

2580. H. R. Fanshawe. Mode and means used in fishing.

2679. W. H. Muntz. Armour.

2887. F. Lipscombe. Purifying water.

2904. C. S. Duncan. Coating or conveying metallic and vegetable substances to preserve them from corrosion or decay.

2945. M. C. De C. Sinnibaldi. Manufacture of armour plates for ships and fortifications.

2957. G. Haseltine. Coffins or burial cases. (A communication.)

2978. J. McKean and T. Greenall. Sizeing or dressing yarns.

3002. T. Brown. Surfacing fibrous materials. (A communication.)

3044. G. Smith. Obtaining colouring matter.

3092. J. Raphael. Umbrella, parasol, sun-shade, and walking-sticks.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2717. C. A. Fournier.
2727. W. Betts.
2798. W. Betts.
2745. E. A. Curley.
2767. J. Anderson.
2779. J. G. N. Alleyne.
2748. J. Hawkins and C. Hawkins.
2758. C. Sells.
2774. J. Combe.
2792. W. Boaler.
2810. S. W. Campain.
2918. A. V. Newton.
2799. J. Mackintosh.
2790. J. Mackintosh.
2791. J. Mackintosh.
2834. W. Hulse.

LIST OF SPECIFICATIONS PUBLISHED

For the Week ending December 12, 1862.

No.	Pr.		No.	Pr.		No.	Pr.		No.	Pr.		No.	Pr.		No.	Pr.	
	s.	d.		s.	d.		s.	d.		s.	d.		s.	d.		s.	d.
1240	0	4	1258	1	2	1275	0	10	1292	0	4	1309	1	4	1326	0	4
1241	0	4	1259	0	8	1276	0	4	1293	0	10	1310	0	4	1327	0	8
1242	0	4	1260	0	10	1277	0	8	1294	1	4	1311	0	8	1328	0	10
1243	1	4	1261	1	0	1278	0	4	1295	0	10	1312	0	8	1329	1	4
1244	0	4	1262	0	10	1279	0	4	1296	0	4	1313	0	4	1330	0	4
1245	0	10	1263	0	8	1280	0	8	1297	0	6	1314	0	10	1331	0	6
1246	0	8	1264	0	4	1281	0	10	1298	0	4	1315	0	4	1332	0	4
1247	0	6	1265	0	8	1282	0	10	1299	0	8	1316	0	4	1333	0	8
1248	1	0	1266	0	4	1283	0	10	1300	1	6	1317	0	4	1334	0	4
1249	0	4	1267	0	4	1284	0	10	1301	0	10	1318	0	10	1335	0	8
1250	0	6	1268	1	0	1285	0	8	1302	0	4	1319	0	8	1336	0	4
1251	0	8	1269	0	10	1286	1	4	1303	0	4	1320	0	8	1337	0	10
1252	2	6	1270	0	10	1287	0	4	1304	1	4	1321	1	2	1338	0	4
1253	0	10	1271	0	8	1288	0	4	1305	0	4	1322	0	10	1339	0	8
1254	0	4	1272	0	4	1289	0	10	1306	0	4	1323	0	8	1340	0	10
1255	0	4	1273	0	4	1290	0	4	1307	0	6	1324	0	8	1341	1	4
1256	0	10	1274	0	4	1291	0	8	1308	0	8	1325	0	4	1342	0	10
1257	0	10															

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

THE

MECHANICS' MAGAZINE.

LONDON, FRIDAY, DECEMBER 19, 1862.

THE ATLANTIC TELEGRAPH.

THE President of the United States, in his massage on the 1st inst., said—"I have favoured the project for connecting the United States with Europe by an Atlantic Telegraph, and a similar project to extend the telegraph from San Francisco to connect, by a Pacific Telegraph, with the wire which is being extended to the Russian Empire." At a moment when the great American Republic is engaged in trampling out the greatest rebellion in history, when we should suppose every nerve is strained, and every moment occupied in raising, directing, and maintaining unparelled armies and navies—the President has found time to consider telegraphic plans submitted to him, and has offered to assist in their establishment. Probably he will soon have an opportunity to render the assistance offered, as we see that the Atlantic Telegraph Company is re-launched. We learn from a report of the extraordinary meeting of the shareholders of that company, held last week, that there is a good prospect of a sufficient amount of capital being raised to lay down another cable. The Right Hon. Stuart Wortley, who presided, confirmed many of the statements we made a fortnight since. It appears that the accidents which have hitherto happened to cables have invariably taken place in shallow water. There has not been a single farthing expended in keeping in repair lines lying in deep water. The whole of an Atlantic line, except the shore ends near the Irish and Newfoundland coasts, would be in deep and perfectly placid water on a soft bottom. There was, therefore, but little reason to apprehend that it would receive any injury when laid. Mr. Wortley used stronger language in condemning the manner in which the first cable was constructed and laid than we considered it our duty to make. He said he was in possession of facts which would enable him to lay bare a state of things which would explain why the first cable had failed. What he could not explain was the miracle by which the cable, under the circumstances, could work at all. It was "ill constructed," "hastily laid," "abused and injured," and "in an unfit state to go to the bottom of the sea." He, however, did not impute blame to any one.

When speaking of the proposed capital for the next cable, Mr. Wortley said that if it were to be of the same size as the one made, it would cost £600,000. Should they, however, determine to make a lighter cable, it might be made for £350,000 or £400,000. It was proposed to raise £600,000 capital by the issue of £5 preference shares. Should the cable be successful, the Government guaranteed 8 per cent. to the shareholders. As the £1 deposit per share was all that was likely to be called in for 12 months, the smallest capitalists in the country may become shareholders in the Atlantic Telegraph Company, and so become co-operators in carrying out a magnificent work. We think the directors have acted wisely in issuing £5 shares; and we are not surprised to hear that nearly £100,000 of capital have already been subscribed. We can only wish the company a speedy and a triumphant success.

THE SMITHFIELD CLUB SHOW.

(Concluded from our last Number.)

THE amount of ingenuity displayed in the lighter articles exhibited in the galleries of the Islington Agricultural Hall was, certainly, remarkably interesting. Many of the things there caused the same pleasure to a mechanician seeing them for the first time, as a neat algebraical expression would to a mathematician, or a well-preserved antique to an antiquary. These machines were exemplifications of the great neck and neck race between the powers of food-production, and those of the increase of human population. They also showed that, fortunately, mechanical, or, rather, constructive talent, is not scarce, as it seems to be developing itself in all classes of society. A powerful judgment is a rare thing, and to find it united with constructive ability, is still rarer. It may perhaps be said that just in proportion as we leave the heavier class of machinery to deal with lighter work, there is greater scope for ingenuity properly so called. Hundreds of arrangements and movements that do very well for light machinery, are totally inapplicable to engine work. As we leave the art of the machinist to enter the more scientific domain of the engineer, there is more demand on our science-directed judgment, and less on our ingenuity. The improvement of the steam-engine, for instance, is not to be sought for in ingenious combinations. It is to be found in a sound combination of the laws of chemistry, with those of construction.

EMERY'S THRASHING MACHINE.

Without pretending that we have chosen the *élite* of the smaller exhibits of the show, we will describe a few of the more novel ones. In this task, from international courtesy, we will give foreigners precedence, and will begin by describing a peculiar American thrashing machine, exhibited by H. L. Emery, the exhibitor of an American cotton gin, which was also to be seen in the western annex of the International Exhibition. This gentleman also sends an endless chain horse-power, to which we will allude.

This machine is somewhat of a novelty. The one exhibited was but 5 ft. high, 4 ft. wide, and about 9 ft. long, weighing complete about 800 lb., and was adapted to the 2-horse endless chain power, also shown, with a capacity, according to the inventor, for about 25 qrs. of wheat, or double that amount of oats, per day, and with a larger power it is said to do 35 to 50 qrs. per day of wheat.

This machine (see Figs. 1 and 2, page 403,) is provided with a cylinder, armed with a series of rows of teeth or spikes about 2 in. long, but inclining about 15 to 20 degrees backward from a radial line. Directly over this cylinder is placed an adjustable concave, armed also with corresponding teeth, also inclining from a radial line to correspond with those on the cylinder. This concave with its teeth may be adjusted and confined in any position required for the different kinds, conditions, and quantities of grain.

The feeding table is level, and placed on a plane with the axis of the cylinder, and the grain and straw are carried over the cylinder and between it and the concave, thereby facilitating the feeding process, and preventing any hard substances being drawn in to its own injury or that of the attendants. A flue is attached to the machine to receive the dust from the feeding side of the cylinder, which flue conducts it over the concave and into the machine at the discharging side of the cylinder, whence it escapes with the chaff from the fan.

In this process of over-shot threshing the straw and grain become thoroughly separated from each other, the grain leaving the cylinder at a lower line than the straw, which last is carried out nearly horizontally from the concave. In this machine the first and almost perfect separation is said to be secured, and the grain prevented from flying into the straw again, as is the case, more or less, with all under shot machines. This is done by means of an endless apron of cells or boxes, which is placed in an inclined position at the discharging side of the cylinder, which endless apron revolves rapidly in the same direction the grain and straw is moving. These cells receive the grain as it is discharged from the cylinder, while the straw passes on over it to the revolving-beater or rake, and thence along the riddles and out of the machine. The rapid movement of the apron of cells is said to avoid the concussion of the grain upon it, and the consequent breakage of the kernels or wear of the cells themselves. The revolving beater or rake is placed at the upper end of the apron, and is of a triangular shape, and is hung upon hollow journals. Through these journals is passed a shaft, which, inside the beater, is of a crank form, with the crank downwards. The ends of these teeth, which are of steel wire, are attached to this shaft, and at the other end they project through the beater at an angle, and as the beater revolves these teeth protrude in and out at each revolution. The purpose of this beater is to accelerate the passage of the straw, especially long straw. It also opens it up, so that whatever kernels of grain may remain in it can fall out upon the riddles.

There are two horizontal riddles, one above the other, extending from beneath the beater quite out to the end of the machine. The upper one is perforated with holes for the ready passage through it of the chaff and grain, which is caught and conveyed back towards the cylinder to the fan near the lower riddle. This upper riddle is also provided with a series of agitating fingers laying flat with it, but having a vertical motion, which serve to keep the straw in suspension, and to aid it in its passage from the machine. The shoe containing the screens and the discharging spouts is placed directly below the endless apron of cells, while the fan is directly beneath the feeding-table and cylinder.

The motion and power is communicated from the propelling power to the cylinder by the main band, and this same band gives motion to the fan. All the other motions are produced by a pair of eccentrics upon the fan-shaft, and one small band to the beater and apron of cells from the same fan-shaft.

In the centre of the machine is placed a rocking-shaft, with arms extending upwards; the excentric rods which are attached to the lower ends of the arms giving to them the motion. From these arms, at different distances from the centre of motion, the several other parts, such as riddles, shoe, &c., owe their action. The shoe, riddles, &c., are all hung with pendulum connections, in such positions as to produce the desired effect; and in such wise that each motion is counterbalanced by some other.

The horse-power was on the ordinary American endless chain principle, but with some improvements. The shafting and gearing are so arranged as to produce a variety of speeds required for propelling different machines. There is a governor attached to the running gear, which controls the speed within any desired limit, and may be adjusted to different speeds found desirable for the animals. This is said to enable horses, bullocks, mules, &c., to be used without harness.

On the shilling evenings there was a most uproarious crowd of people round this machine, insisting on getting on the endless chain, and putting it to work. It was thus put to a rather severe test.

THE COW-MILKER,

Another American invention, that excited much attention at the Great Exhibition, was also sent to the Smithfield Club Show, by several exhibitors. This is, namely, the "Cow-milker," the india-rubber pump, and india-rubber "teat-glove" (if we may use such a term), which is familar to most of our readers. It is said to fail in the hands of a careless farm-servant, as, indeed, most machines would. When its action is carried on too long, it is said to pump blood from the cow, as well as milk. Some authorities aver that all the teats of a cow are not equal in their milk-producing powers. This machine, however, is made to act equally on all. If the sum for which the Yankees are said to have sold this invention in England be the correct one, the machine made a good beginning in milk-pumping powers. To a "cute Yankee" the Goddess of Science herself is but a good big cow with plenty of milk.

Another foreign invention that excited some attention was

A HORSE-CLIPPING MACHINE,

exhibited by Messieurs Carrere de Nabat, of Paris. We saw it at work in a stable close to the Islington Hall, and as far as we could judge, during a short inspection, it seemed to do its work very completely. It was patented some two or three years ago in England, and the following wood-cuts show it in its then shape.

This apparatus for shearing, more especially horses, asses, and cattle, consisted of two metal supports screwed the one to the other; in these supports was placed a shaft square at one end, and carrying at the other a toothed wheel, gearing into a pinion fixed upon another shaft, this shaft carrying two plates or wheels with arms having slits in them, in which the ends of steel blades are secured by press screws. These spiral blades rubbed against a lower blade. This latter blade was attached to the two supports by two pivots, and beneath was a steel comb furnished with a spring, tending to raise the said blade, the comb being screwed to the supports. The apparatus, when used, was to be held in one hand, while the other, by means of a "Breguet" key, turned the first-mentioned shaft, and thus nearly every part of the animal could be passed over and shorn close or otherwise at will, the length of the cut being regulated by the thickness of the comb.

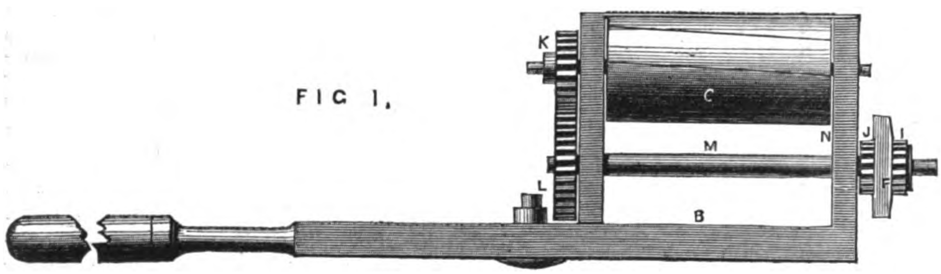
It will be at once seen that the instrument is substantially a small lawn-mower. It is moved against the grain of the hair of the animal. The legs and the lower parts of the chest and head must still be clipped by scissors, but this may be done while the other parts of the animal are being shorn by the machine. Since taking out their first patent the inventors have greatly improved the way in which the motion is transmitted to the little "lawn-mower." A flexible chain is used for this purpose, formed of articulated links, and four wires of tempered steel. This chain is caused to rotate by means of a little portable frame, worked by a hand labourer. It is held down by the left hand, while the right works a lever up and down. By means of gearing the blades are caused to revolve at the rate of 7,560 revolutions per minute. Each stroke of the lever causes four revolutions of the chain; the chain increases this by three times, and the roller being fitted with seven knives, thus takes 126 cuts for each stroke of the lever. The lever can be worked up and down about 60 times per minute. According to the inventors, two horses can be completely clipped in five hours, requiring three men — the operator with the "hair-mower," a labourer to drive the chain, and, thirdly, the clipper, with ordinary scissors, for doing the legs and lower parts of the chest and head. It is said that clipping has been tried with success by an eminent French grazier, as a means for quickening the fattening up of oxen. Some time before the International Exhibition, Messrs. De Nabat showed their machine to the French Commission appointed by the Emperor to choose the French machinery they considered worthy of being sent to the London Exhibition of 1862. This apparatus was rejected by the commission, the machine being deemed impracticable. After divers explanations being given to the commission by the inventors, a committee was formed to examine the machine. None of these gentlemen appeared at the promised time, finding it more convenient to refuse the application altogether for exhibiting the machine in London. This is another specimen of the proverbial wisdom of corporate bodies. The inventors therefore determined to exhibit the machine in England on their own account. Considering what mechanical rubbish was sent to the Exhibition in some instances, the exclusiveness in this case seems rather "de trop." The inventors informed us that five horses belonging to her Majesty, in the Queen's stables, had been lately clipped by this machine.

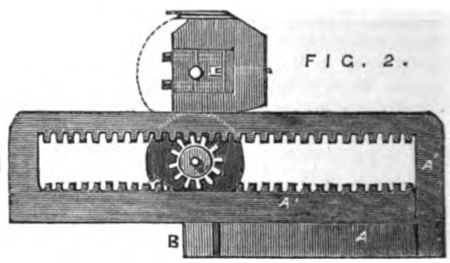
HOUSE'S CRUSHING MACHINE.

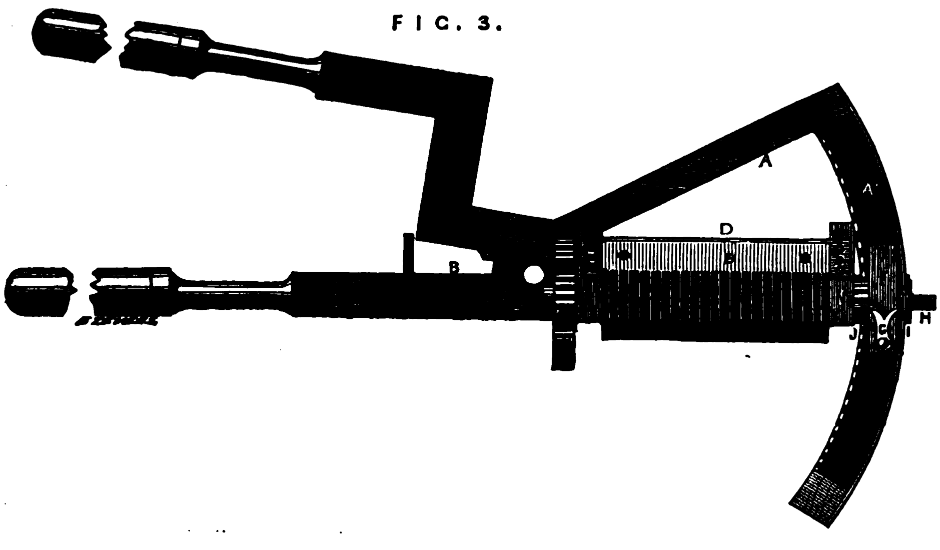
The accompanying engravings show a machine for crushing guano, grain, oil-cake, mortar, cements, and similar substances. It is certainly absurdly simple, and it is said to be very efficient. The rollers are shaped somewhat like the V-grooved gearing applied to several machines exhibited in the western annex. Instead of the grooves touching, intermediate spaces are left between the rollers, through which the substances to be crushed are passed.

These rollers may be either made in one or more parts, and composed of steel or chilled cast iron. In place of being cylindrical, they are formed on their surfaces with a number of alternate V grooves and projections, the projections of one roller working into the grooves of the opposite roller. These grooves and projections may be smooth on their outer surfaces, or they may have a series of notches formed on them, with a view to the effective disintegration of the substances. When these rollers are made in several parts, each part will consist of a disc, having its periphery bevilled on each side, so as to present a Λ or knife edge. By placing a number of these discs upon a square shaft, a roller of the description referred to will be obtained, each disc being formed with a series of teeth or notches on its bevilled edge, or made smooth as before described. In some cases it is proposed to use, in combination with these rollers, a feeding roller, provided with a number of projecting cups, such roller working at the bottom of a feeding hopper, and tending to feed the substance in a regular manner to the rollers, the feed rollers being driven by suitable gearing from the reducing rollers. It is proposed to use when requisite a vibrating

HORSE-CLIPPING MACHINE.







HOUSE'S CRUSHING MACHINE.

Fig. 1.

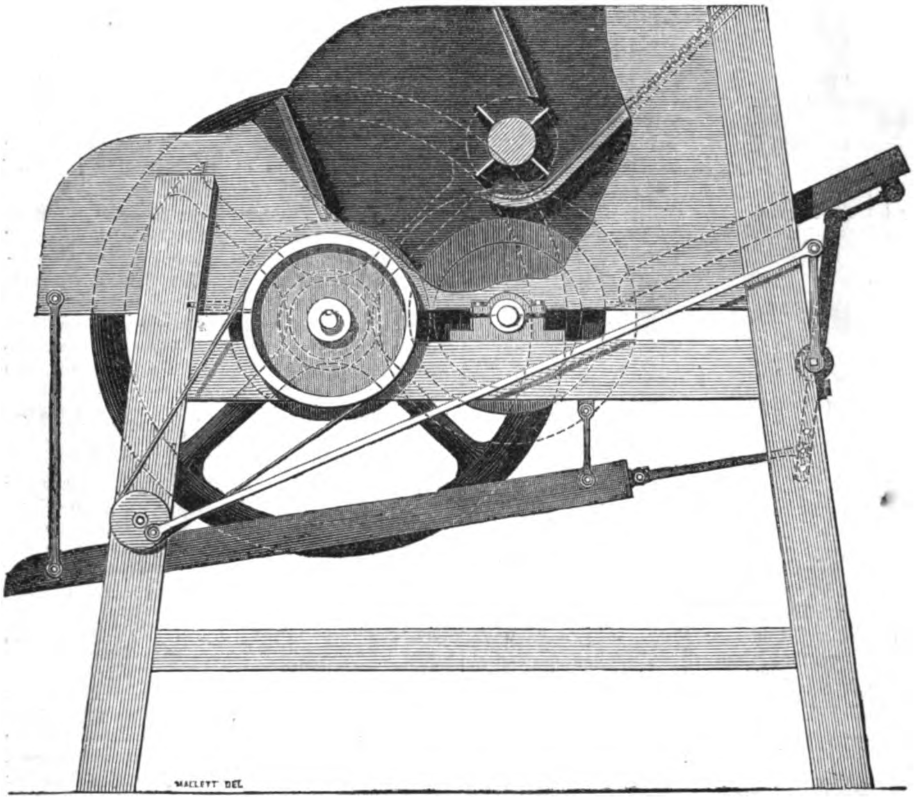
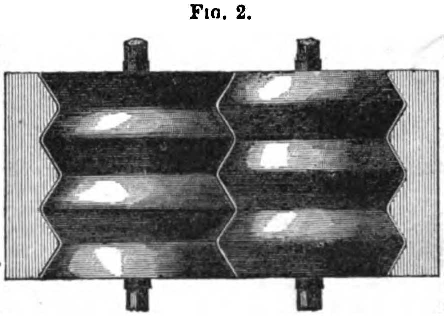


Fig. 2.



screen in combination with the above mechanism, for the purpose of sifting the substance as it leaves the rollers. In order to keep the rollers clean and prevent them from becoming clogged, a scraper is applied to one or both rollers.

Fig. 1 of the engravings represent a side elevation of the machine, with a portion of the side partly broken away to show the internal arrangement; and Fig. 2 is a detailed plan of the peculiar V rollers and scrapers in connection therewith.

The main framing of the machine, to which are applied the two side pieces, is partly broken away, as above described; and the two rollers, having annular V grooves, *e e*, are provided or not with teeth, or serrations, as required, upon the surfaces of the grooves. The scraper plates are secured to the framing, and so shaped as to correspond to the peculiar form of the rollers; the main driving shaft may or may not form the axis of one of the rollers; it is provided with a fly-wheel, and driving handle or driving pulley, and carries a spur pinion, or small spur wheel, gearing into a large spur wheel fast on the axis of the second roller; this wheel gears also into a pinion, or small spur wheel, fast on the axis of the feed roller, which is provided with spikes, or cups, on its surface, as before described. On the opposite end of the main driving shaft there is keyed a grooved pulley, which transmits motion, by means of a band, to the small pulley; this pulley carries an eccentric pin, which imparts a longitudinal vibrating motion to a connecting rod, jointed at its opposite end to a rocking lever on the transverse rocking shaft; to the middle of this shaft is keyed a second rocking lever, projecting both above and below the same, the upper end being coupled by means of a link with a vibrating feeding spout, whilst the lower end is connected by a link with the top of the inclined vibrating riddle or sieve, the lower end of which is suspended by links from the side pieces of the machine; the material or substance to be operated upon is fed in from the vibrating spout (if the spiked feeding roller is not required), or from the stationary feeding hopper if the action of the feeding roller be found requisite, and is thence carried (if fed from the latter hopper) by means of the feeding roller to the crushing rollers, one of which in some cases may revolve faster than the other, so as to give a draw-crushing action, and finally drops on to the vibrating sieve or riddle, should a screening action be found to be desirable.

RANSOME'S HARROWS.

We alluded last week to Messrs. Ransome's harrows. The following remarks and illustrations (see next page), give a description of this invention. This harrow was, we believe, also exhibited at the Battersea Show, last spring.

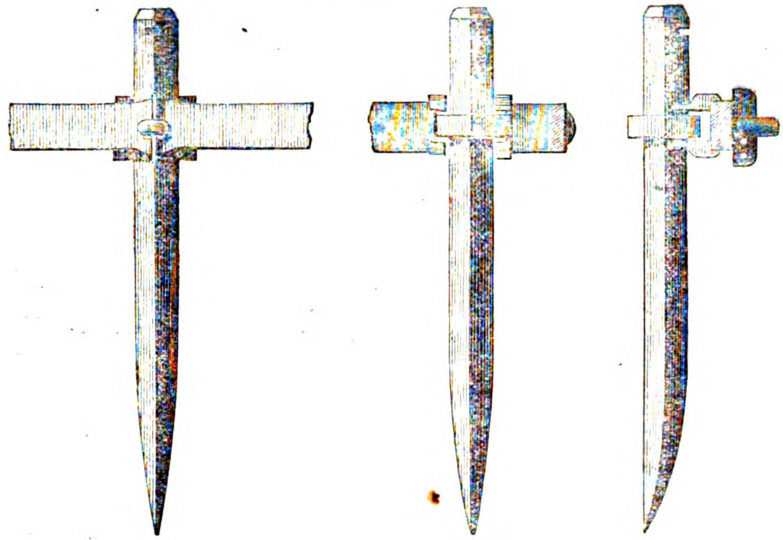
In constructing harrows having rigid frames, it has been usual so to make them that the same fastenings which held the tines or teeth to the frame also secured the parts of the frame the one to the other. According to this plan the fastenings of the teeth are made independent of the fastenings of the frame in the following manner :—The framework is composed of longitudinal and transverse bars, either rivetted or bolted together, and the teeth are attached to the cross bars by means of metal loops or clasps, which pass round the teeth, and are tightened up by means of nuts, cotters, or otherwise. Between the tine or tooth and the bar a casting, having a groove in it, is interposed to form a suitable bed for the tooth, the casting is prevented from shifting on the bar by lugs or otherwise, and it is held by the loop or clasp which embraces the tine or tooth. The tooth is made square in section, and has V-formed grooves to the bed casting to correspond therewith. In place of placing castings on the frame to receive the tines, the cross bars of the frame may be made of malleable cast iron, and suitable grooves or notches may be produced in them at intervals where the teeth are required; or the frame may be made of wrought iron with suitable grooves or notches, or with some forms of tine or tooth the grooves or notches may be dispensed with. The advantages of this form of harrow are, that any tooth can be taken out and a new one put in with less trouble, and independently of the fastening of the framework, and also that the strength of the tooth is preserved in the mode of attaching it to the cross bar.

This plan has also for its object the forming harrows in such a manner that they shall have greater play and freedom in work than the ordinary rigid frame harrow. With this object each tine or tooth of the harrow is attached to an axis at a distance in front of it by a bar or lever which is free to turn on the axis. The axis of the leading tines or teeth of the harrow is immediately connected with the draught, and the axis of the bars or levers of each following row of tines or teeth is carried by the rear ends of the bars or levers of the row immediately in advance. Or the teeth of each row, with the corresponding bars or levers, may be formed together as a rigid frame, and the successive frames forming a harrow may be jointed together in the manner already described. The harrow may, as is practised with harrows of the ordinary construction, be drawn either end foremost. Thus it will be seen that the rows of tines or teeth are not rigidly connected with each other, and consequently the harrow is able to adapt itself to uneven or rough land, and it is less liable to clogging, owing to the parts not being rigidly connected. The figures show one way in which this plan is carried out, cotters being used, although, of course, screens may also be adopted. There is a notch in the tooth into which a projection on the metal bed catches for the purpose of preventing the tooth from sliding up or down; although only one notch is seen in the figure, it is obvious that by making several the teeth may be made to project any required distance below the frame or transverse bars.

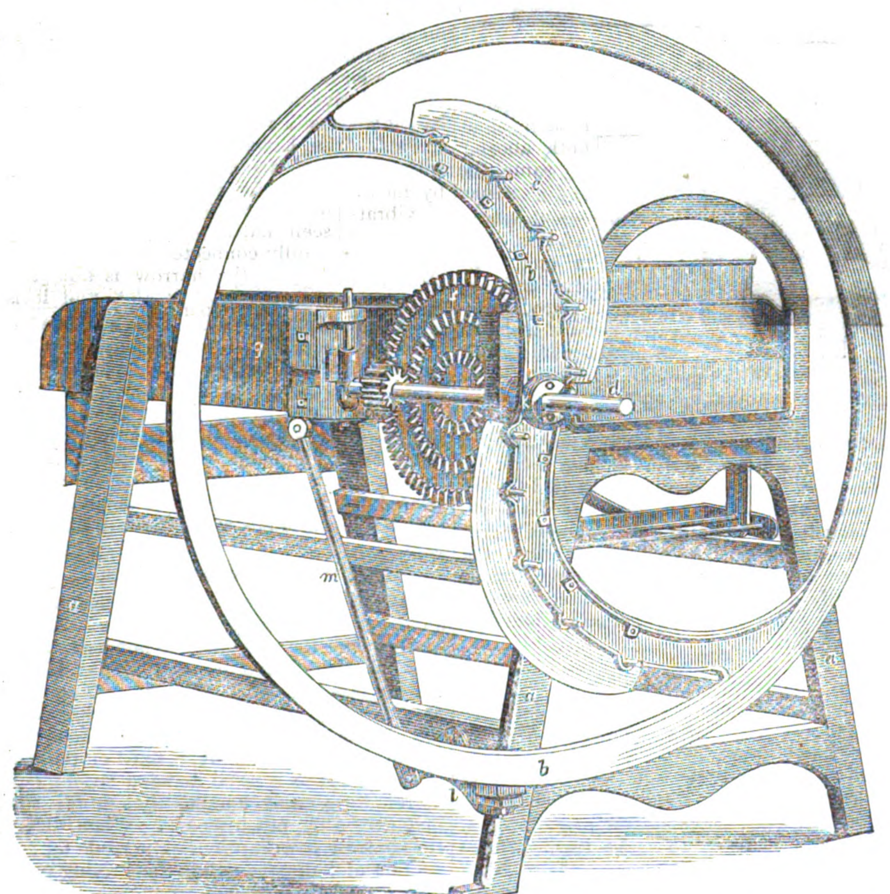
WARREN'S CHAFF CUTTER.

The following seems a neat arrangement for a chaff-cutter, sent by Mr. Warren. A large placard over the machines announced that it was "*the long looked for chaff-engine, king of the chaff-cutters, &c.*" This is puffery more worthy of a quack toothdrawer than of a respectable machinist. The fly-wheel, with the knives carried thereby, is fixed on the main shaft, which, as is usual in hand machines, is driven by a crank handle, though the shaft may driven by other means. When driving the shaft by power, provision is made for connecting and disconnecting the driving pulley on the shaft by means of a clutch box slid on the shaft by a hand lever. The driving shaft is at right angles to the ends of the feed rollers, and it gives motion thereto by means of a pinion gearing with the teeth of a face wheel, which turns on a stud at the side of the trough or box of the machine

RANSOME'S HARROWS.



WARREN'S CHAFF-CUTTER.



next the driving shaft. The face wheel, by means of a pinion thereon, gives motion to toothed wheels fixed on the axis of the feed rollers next the face wheel, so that the face wheel is geared by its pinion directly with the toothed wheels on the axes of the feed rollers, in place of the axis of the face wheel being extended to the other side of the trough or box of the machine; and in combination with this arrangement, the face wheel is formed with three, or more than three, circles of radial teeth, and the driving shaft crosses the centre of the face wheel. The pinion on the driving shaft, which gives motion to the face wheel, is capable of being slid along the shaft, in order that it may gear with either of the circles of teeth on the face of the wheel, and, when slid along the shaft, it moves correctly in a radial line to and from the centre of the face wheel. The boss or nave of the pinion on the driving shaft is made with a groove all round it, which is embraced or partly surrounded by the end of a bar, which is made capable of sliding (in a suitable projection or bearing fixed to the side of the trough) to or from the centre of the face wheel, and this sliding bar is made capable of being fixed and retained in position when the pinion is in a correct position to gear or work in any one of the circular rings of radial teeth on the face wheel.

HUNT and PICKERING exhibited, amongst other things, some scythes fixed with a key or wedge into a gas-pipe handle. This attachment seemed a neat one, but the instrument, as a whole, did not seem very handy.

PAGE and Co. sent a number of articles, among which we remarked a rather neat oil-cake breaker, and a combined horse-hoe. We will illustrate and describe these next week.

H.

GROOVED FRICTIONAL GEARING.

ACCORDING to the *Scientific American*, frictional gearing, instead of toothed wheels, seems to be coming into extensive use in America. The mode by which the motion is communicated is as follows:—The peripheries of the wheels are provided with Λ-shaped grooves around their circumferences, the extreme points of the Λ being removed to insure a good bite; and each Λ fitting into the recess formed by a W on the other wheel; the smallest possible pressure is thus made to give a very large amount of force. It is calculated that the adhesion or driving hold of the surfaces of these grooved wheels is about nine times that of plain surface frictional wheels. When working at 1,000 circumferential feet per minute the contact pressure requisite for transmitting a standard horse-power is 22 lb.; at double that circumferential speed, 11 lb.; and in the same relative proportions at other speeds; a wheel 8 ft. in diameter, working at 40 revolutions per minute, gearing with a pinion, requiring a large amount of pressure to transmit 100 indicated horse-power. This system of gearing seems to be thoroughly adapted both to heavy and light machinery; and wherever there is liability to sudden concussion or strain they are invaluable, since, from their very principle, it is evident that they cannot be damaged. In case of a sudden jerk, a slight and immaterial slip is the sole inconvenience, the wheels being left in quite as good order after the jerk as they were before, instead of, as would be the case with ordinary gearing in use, broken teeth having to be repaired before the working could be continued. The smoothness with which the frictional gearing works is remarkable. Some of the wheels upon this system have been in use many years, and continue to give the greatest possible satisfaction; and it is considered that where the wheels are properly proportioned to the work to be done, they are more durable, and transmit power with less waste by friction, than is incurred by using toothed gear. We allude to this kind of gearing in our article on the Smithfield Club Show.

AMERICAN ORDNANCE DEPARTMENT—GUNS AND IRON-CLADS.

CAPTAIN J. A. DAHLGREN, chief of the North American Ordnance Department, has presented a long report to the Secretary of the Navy, from which we condense some interesting information. He states that there is now a prospect of obtaining a considerable amount of nitre for the manufacture of gunpowder, from our own resources, but the chief supplies for the whole world are still in the hands of the British, and are obtained from the East Indies. There are seven private establishments fabricating cannon for the navy, viz.:—Knap and Rudd, Pittsburgh, Pa.; Alger and Co., Boston, Mass.; R. P. Parrott and Co., Cold Spring, N. Y.; J. Sparrow, Portland, Maine; Hinckley and Williams, Boston, Mass.; Z. Chaffee,

Providence, R. I.; and Seyfert and McManus, Reading, Pa.

IRON-CLAD SHIPS.

The use of solid shot fired from 42-pounders at sea, ceased at the battle of Navarino. After this Captain Paixhan introduced shells. The terrific effects of these were first really displayed at Sinope, by the Russians. In 1855 the French first used three iron-clad vessels at the Kinburn forts, and none of the Russian shot was able to pierce the plating. The first seagoing iron-clad frigate built was "La Gloire," and England soon followed the example with the "Warrior." These are large vessels, of great draught. The American coast being mostly shoal requires vessels of light draught, hence they are inaccessible to heavy iron-clads like the French and English frigates. Vessels of the "Monitor" and "Ironsides" classes are likely to suit our present purposes. Captain Dahlgren states that Whitworth first demonstrated that thick iron plating, backed with wood, could be pierced with shells. The 11-inch guns of the "Monitor" were chiefly designed for shells, which were computed to have an initial velocity of about 1,120 ft. per second; but this class of gun is capable of throwing 169 lb. solid shot with 30 lb. of powder, and an initial velocity of 1,400 ft. per second. The "Merrimac" was armed with 9-inch guns; their shot did no material damage to the "Monitor;" the damage which the shot of the latter effected is not known. The wrought-iron shot furnished to the "Monitor" weighed 186 lb. If fired with 15 lb. of powder, their initial velocity would only have been 1,050 ft. per second. The "Monitor" only fired 42 shots at the "Merrimac," and many of these failed to strike, from the difficulty of aiming with precision. The "Monitor" and "Galena" failed to make any impression in the attack on Fort Darling, on the James River, because their guns had to be so much elevated.

GUNS FOR IRON-CLADS.

Rifled shot is the most accurate at long ranges, but when they strike and are deflected, they tumble over and have a very erratic flight. Such shot, therefore, have no capacity for ricochet firing, which is one of the most certain modes of operating in naval service when round shot is used. Rifle shot have greater penetrating, but less percussive power than round shot. The rifle gun, however, is gradually making its way into the service. The "Galena" was fired upon at Fort Darling with round shot from 64-pounders. These passed through her plating, and the entire structure of the vessel was much damaged.

An 11-inch gun can be fired once per minute with a well-disciplined crew; but some improvement must be made before a 15-inch gun can be fired once in three minutes. The "Roanoke," which is being converted into an iron-plated turret ship, will be able to throw 2,700 lb. of shot at once. The effect of her shell of 330 lb., and solid shot of 450 lb., from 15-inch guns, will be damaging beyond former experience. One of the 15-inch guns has been tried on 5½-inch iron plates backed with 18 in. of oak, and placed at 200 yards distant. The shot passed through this target with ease. One of the 11-inch cast-iron guns (weighing 16,000 lb.), has been fired 155 times, with charges varying from 20 to 30 lb. of powder and shot of 165 and 169 lb. This gun does not exhibit any signs of giving way. A great number of experiments with these cast-iron guns afford proof that they are as strong and durable as the forged British guns.

COAST DEFENCES.

Capt. Dahlgren states that batteries of masonry should not be exposed to rifle cannon. The exterior of stone and brick forts should be covered with iron. The low stone forts at the Narrows of New York are not well calculated to hinder the passage of an iron-clad vessel. The earth works on a high elevation are superior. Steam rams will be of little use, unless their speed is greater than that of other vessels. Floating iron-clad batteries should be employed to assist forts in case of an attack by iron-clad frigates.

ARMOUR PLATES AND WOOD BACKING.

SIR,—I do not write with the intention of continuing the discussion between "Civilian" and myself, for it does not require prolonging. I acquiesce most cheerfully in your decision to close it, for no one can fail being struck dumb in admiration of the gallant impetuosity with which your correspondent has invited your readers to a scientific affray, whilst trailing his coat behind him; or help cowering before the charming confidence with which he has handled his shillelagh, although a novice, as he confesses himself, in the science of his weapon. I am sure I retire from the scrimmage in dismay, happy enough to escape, though with plenty of kicks, from all the braining blows. But, dropping the appropriate figure, I do claim to be heard in protestation against two serious misrepresentations. The one refers to an opinion, the other relates to a practical suggestion; but in respect to neither do I find it to be agreeable to be held up to your readers in a light that would indicate I had taken leave of my senses. Besides, I never will allow, if I can help it, a misrepresentation, when it is founded on an unfair quotation, to pass unnoticed.

"Civilian," by adroitly quoting the following portion only of a sentence, represents me as advancing an independent proposition, and one so insane and vague as to be sheer nonsense:—"It is obvious at a glance that for all which is under water wood is a relief and iron is a burden to a ship." Now this as it stands may be either true or false, according as it is supplied with the condition of a variable or a given magnitude of displacement for the vessel to which the wood or iron is applied. My words were—"When the *defences* are placed outside [the vessel, as in the case of the "Warrior,"] it is obvious at a glance that for all which is under water, wood is a relief and iron is a burden to a ship;" and thus by recognising the special case of already existing ships, and the additional displacement given to them, sense is restored to the quotation, and correct sense too, which neither "Civilian" nor any one else is able to gainsay.

Allow me here the opportunity, Mr. Editor, without going into fresh matter, to give a little expansion to and explanation of my former remarks, for they may not have been clearly understood in other quarters. On the other hand then, when the displacement has been made a given quantity, and has been charged with all the weight consequent on construction (but the question whether wood or iron is better for that purpose is an extraneous one, which we need not, *apropos* to this subject, be troubled about), any further addition to the weight for purposes of defence will be altogether a burden, whether wood or iron be employed; but whether wood or iron is the greater burden—and here is the gist of the subject—or how much more a burden one of them is than the other, protection against shot being equal, is a problem which neither "Civilian" nor myself can solve, because we are in want of the data. From a calculation full of assumptions, I have stated that I thought they may be on an equality in this respect, but I do not wish to commit myself to that opinion. Experiments only can determine. But whether the result be in favour of wood or iron, still the curious conclusion holds good which I pointed out in my last, that each defence being carried to the extreme, the ship sinks in the one case and floats in the other. The fact is, that increasing thickness of the iron defence must be governed in the main by a corresponding advance in the least magnitude of displacement compatible with proper flotation; and if we are to provide security against the mighty pieces of ordnance that are about to be brought into use, so that their shot shall not endanger the sinking of the vessel, that magnitude of displacement will, I fear, be a very large one, even with great sacrifices of seagoing qualities. But to a wood defence there is no limit imposed by a minimum of displacement; protection can be so augmented, and can be afforded to vessels so small, that their sides shall meet, when, if [illegible]ged, they will will be more efficient than ever as against being sunk; although, doubtless, it is an advantage gained at the expense of many valuable properties. But sacrifices will have to be endured all round. Everything depends on what property we propose to make paramount. If vessels are to be made unsinkable, they must give up roaming the seas as steamers, unless they are of extraordinary magnitude. We shall have to go back to sail power, and to little better than rafts in construction, for all fight craft, or else with certainty to go to the bottom in the first hostile encounter. The Americans seem to understand and to be acting on this principle of immense thickness in the wood portion of the defence, but all such vessels, except the very large ones, will, of course, be coast and harbour bound, as steamers.

The other misrepresentation, the subject of animadversion, relates to my proposal for armouring ships. "Civilian" says, that I hold "the eccentric idea of soldering iron plates in one mass over the hull of a ship." Now it is very curious, but I never said anything about iron plates, nor about soldering them together, nor have I proposed to *solder* plates of any kind together. The idea is absurd, and I do not wish to have the credit of it. What I proposed, was, to lay down upon a wood backing a course of steel plates 3¼ in. thick of a moderate size, and then to overlay them with a course of gun-metal plates 2¼ in. thick, and as large as possible. These gun-metal plates are to be fused to each other at their edges, that is to say, they are to be burned together, as it is technically called, into one mass (not to the steel plates beneath them) just as the parts of a bronze statue are, and I see no more difficulty in the one case than in the other. It would be necessary to guard against injuring the wood backing by the heat passing through the steel plates, but this may be obviated by a thin non-conducting coat of plaster and brick dust to prevent contact between the heated metal and the steel plates. But instead of this old-fashioned method of burning metals together, the modern appliances of the blow pipe with coal gas and common air, to say nothing of the cheap oxygen gas with which we are to be favoured, would accomplish the purpose with greater facility and with much less conduction of heat. The scheme is practicable, but costly. Only experiments could tell how much more efficacious for resistance such a defence would be than an equal weight of wrought iron.

I am, &c.,

Dec. 15. BENJ. CHEVERTON.

P.S.—Will you allow me to add, for the sake of some who may be curious on the subject, that in the full investigation of the action of a projectile on armour plates, the concentration of the action in regard to time must not be overlooked, although its concentration in regard to space, as being less recondite for discussion, has alone engaged my attention.

PATENT ELECTRIC BELLS.

ONE of the most important novelties in bell ringing and, at the same time, the latest introduction of scientific appliances to our dwelling-houses, is the new system of ringing bells by means of electricity. We have rung bells on one side of the Atlantic by batteries fixed on the other, but until now we have never thought of having a similar communication between our dining-rooms and our kitchens, between our drawing and bed rooms and our servants' halls. We have hitherto pertinaciously stuck to the old-fashioned system of cranks, levers, and copper wire, only occasionally economising labour by speaking-tubes. The invention, of which Messrs. Newall and Co., of Sloane-street, are the sole agents, possesses many great advantages. 1st, It is simple—a battery charged with chemicals is placed in any unappropriated corner of the house to keep company with the gas-meter; two wires are attached to the zinc and copper poles by which the electricity is generated and carried off. These two wires being brought together in any part of the house, causes one or more bells to ring. 2nd, It is inexpensive, as the cost of replenishing the chemicals of a battery large enough for 20 bells does not exceed 5s. a-year. 3rd, It is universally applicable; it can be taken over any uneven wall or floor and in any tortuous direction without affecting the result; it can be applied to the desks of railway stations, banks, or with equal facility to the tables of their managers. 4th, It is easily worked; it can be worked by the faintest pressure of a nob, by a lever, or by almost an infinite variety of methods; 5th, The wires can be coated with silk or cotton of any tint, so as to accord with the decorations of a room, or to be practically invisible upon them; it can be fixed to shutters, doors, and windows at night, and be made to give thence an alarm by, if required, ringing every bell in the house. There seems, in fact, no limit to the usefulness of these electric bells for domestic purposes. They have been already fixed in Windsor Castle and in several other large buildings, where they

have given every satisfaction, but as it may be difficult for such of our readers as feel interested in them to see them there in operation, a visit should be paid to Messrs. Newall's premises, in Sloane-street, where the full value of the invention can be seen, and any doubts about their efficacy be immediately dispelled.

INTERNATIONAL EXHIBITION.

JURORS' REPORT.

Class X., Section A.—Civil Engineering.

JURY.

A. Bommart, France; General Inspector in the Imperial Corps of Bridges and Roads.
J. Kelk, London; Contractor.
Koch, Zollverein; Government and Architectural Councillor, Berlin.
J. Leclerc, Belgium; Inspector of Agriculture and Engineer of Bridges and Roads.
Maurice Loehr, Austria; Imperial Councillor of the Board of Trade and Public Works.
C. Manby, F.R.S., London; Hon. Sec. to the Institute of Civil Engineers.
Thos. Page, London; Civil Engineer.
Sir J. Rennie, F.R.S., F.G.S., President of Section, London; Civil Engineer.
Marquis of Salisbury, K.G., Chairman, London.
Cesare Valerio, Italy; Member of the Italian Parliament.

Associates.

Baron Baude, France; Engineer to the Imperial Corps of Bridges and Roads.
Mille, France; Engineer-in-Chief of Bridges and Roads.

I.—Bridges.

There are few more important and difficult operations in civil engineering than the construction of bridges across great rivers, estuaries, and valleys, and none which require greater skill and judgment in design and construction, in order that the works may be properly adapted to fulfil the object in view in the best manner and at the least possible cost; and, it is but justice to say, that amongst the numerous objects of this class submitted to our examination, there are works of the highest merit, and which have been most successfully carried into effect.

Amongst the most prominent and important of this kind may be mentioned the class of wrought-iron tubular girder bridges exemplified by the remarkable and extensive bridge erected across the river St. Lawrence, at Montreal, for the Grand Trunk Railway in Canada. This bridge was based upon the system introduced in the "Conway" and "Britannia" bridges, on the Chester and Holyhead line of railway.

All these three bridges were designed by and constructed under the direction of the late Robert Stephenson, M.P., F.R.S., and both he and the resident engineers and contractors are entitled to the greatest possible credit for the novelty, originality, and boldness of the designs, the admirable and ingenious contrivances employed in the structures as they have been carried into effect, as also for the very complete manner in which they have answered the objects for which they were designed and constructed, so as to offer the least possible obstruction to the navigation, and at the same time to afford the greatest and most substantial accommodation to the traffic passing over them. They were necessarily attended with great practical difficulties in the execution, not only in combining and putting together the vast masses of wrought-iron, rarely before attempted upon such a great scale, but also in the planning and construction of the foundations and the masonry piers, particularly in those of the "Victoria" bridge, across the St. Lawrence, where special provision was necessary for resisting the pressure of the immense masses of floating ice set in motion on the breaking up of the frost at each spring. For the foundation of these piers and ice-breakers, Mr. Hodges, the engineer of the contractors, devised a most ingenious system of moveable coffer-dams, which answered admirably, and to him, as to Sir Morton Peto, M.P., Mr. Brassey, and Mr. E. L. Betts, the enterprizing contractors for the works, the utmost credit is due for the successful manner in which the great difficulties were met and overcome, and for the general successful result of their work. It is not necessary to describe these great works in detail, as this has already been done in the masterly and elaborate description of the Conway and Britannia bridges by Mr. Edwin Clark, and Messrs. Peto and Betts, and Mr. Hodges in the description of the "Victoria" bridge; to which works, those who take an especial interest in these important subjects are more particularly referred.

To Mr. G. R. Stephenson, as the representative of his cousin, the late Mr. Robert Stephenson, M.P., F.R.S., has been awarded a medal for the extraordinary boldness of conception and the great ingenuity of the construction; and to Sir S. Morton Peto, Bart., M.P., Mr. T. Brassey, Mr. E. L. Betts, and Mr. J. Hodges, a collective honourable mention, for the successful execution of this bridge, and for the ingenuity displayed by Mr. Hodges in the construction of the coffer-dams.

Next, and scarcely inferior in importance to the above-mentioned bridges, may be mentioned the bridge across the Wye, at Chepstow, and the "Albert" bridge over the Tamar, at Saltash, both designed by, and constructed under the direction of, the late Isambard Kingdom Brunel. These are of a somewhat different character, being a combination of a wrought-iron superstructure with cast-iron columns, the arrangement being upon the insistent and the suspension principles combined.

It may be a question whether one of these systems, particularly the insistent principle alone, if properly applied, of the requisite dimensions, would not have been as efficient, simpler, and better calculated to have answered the object in view: nevertheless, these two bridges have been extremely well designed and constructed, and they practically fulfil their object most successfully. The foundation of the great central, or deep-water pier, in the Tamar, for the Saltash bridge, was a most difficult and hazardous undertaking, as it was necessary to carry it down through a depth of water of 82 ft. at high water, with a rise of 18 ft. of tide. This foundation was carried down through a bed of soft mud, nearly 16 ft. thick, to the solid rock, which was effected by means of a wrought-iron cylinder of 37 ft. diameter and 90 ft. in height, which was forced down to the bottom partly by insistent weight, and partly by means of atmospheric pressure. The proceedings were so well arranged that little hazard was incurred, and the works of sinking the cylinder, constructing the masonry foundation, erecting the iron columns upon it, and lifting the tubes, were most successfully accomplished. In connection with the execution of this work, Mr. Brereton, the chief assistant of Mr. Brunel, should be mentioned as having carried out the views of the engineer most efficiently. To Mr. Isambard Brunel, as the representative of his father, the late Mr. I. K. Brunel, F.R.S. (United Kingdom, 2,245), has been awarded a medal, for the boldness of design and for ingenuity and goodness of construction and for the novel and excellent method of sinking the foundations of both these bridges.

The next work of this class is the lattice bridge across the river Boyne, at Drogheda, on the line of the Dublin and Belfast Railway. It was designed by and constructed under the direction of Sir John Macneill. It is upon the lattice principle of wrought iron, and is by far the largest structure of the kind which has hitherto been erected in the United Kingdom. The invention, or rather the first great application of this class of bridge, may be said to have taken its origin in the United States of America, where such structures of timber have been employed to a great extent. The merit of their introduction to Great Britain in the form of wrought iron may be attributed to Sir John Macneill, and they are now largely employed on the Continent and indeed all over the world. They come under the class of girder bridges, and the chief merit may be said to consist in the lightness and economy, consistent with a proper degree of strength. The bridge over the Boyne above mentioned, as well as another upon the same principle across one of the public streets at Dublin, upon the same line of railway, are extremely well designed and constructed, and are excellent examples of the kind, and as such are entitled to a considerable degree of credit.

To Sir J. Macneil, F.R.S. (United Kingdom, 2,316), has been awarded a medal for the importance of the design and the successful execution of this bridge; in which he received very efficient co-operation from James Barton, resident engineer.

Several large bridges upon the same principle have been designed by, and constructed for, Lieut.-Col. Kennedy, upon the line of the Bombay and Baroda Railway, India. The piers of these bridges are formed by means of Mitchell's cast-iron screw piles, firmly fixed in the bed of the river, and properly braced together by wrought-iron ties. These structures have not any pretensions to originality, but they are remakable for the simplicity and economy of their construction, for their successful completion, and for their completely answering the object for which they are intended. To Lieutenant-Colonel Kennedy (United Kingdom, 2,307) has been awarded a medal for the extensive application of screw-piles to bridges in India.

To Messrs. Gilkes, Wilson, and Co. (United Kingdom, 2,290), has also been awarded a medal for the excellence of execution of the iron railway viaduct, with cast-iron diagonally braced piers, erected by them over the river Belah, from the designs and under the direction of Mr. Bouch.

In connection with this branch of engineering, a medal has been awarded to Mr. E. C. E. Dapples, of Lausanne (Switzerland, 127), for an ingenious modification of the screw-pile shoes for timber or iron piles.

Next must be mentioned the bridges, models of which are exhibited (under the No. 1,251, in the French Catalogue) by the Minister of Agriculture, Commerce, and Public Works of France, whose liberality in collecting and transmitting to this country so excellent a collection of models of interesting works cannot be too highly eulogized. Many of these bridges are remarkable for the ingenuity and boldness of their design, and for the very successful manner in which they have been carried into effect.

First amongst these may be mentioned the great Turning Balanced Bridge across the Penfeld, a creek connected with the naval arsenal of Brest; this structure is by far the largest of the kind that has ever been attempted, and as such requires particular notice. It is composed wholly of wrought iron, with the exception of the counter-balance weights, which are of cast iron. The total width of the opening, or clear space between the two circular piers, or abutments on the opposite shores, is 106 metres. The bridge itself consists of two equal portions, which meet in the centre, at an elevation of 19½ metres above the level of high tide, each being supported on either side by a massive circular tower of granite masonry, upon which they revolve on a series of cast iron rollers, in a massive iron frame, which is made to rotate by means of a system of wheel-work, worked from the top by two men for each half, by whom, in calm weather, the operation of opening and shutting the bridge is performed in about fifteen minutes.

When the bridge is closed it is fixed in its place by means of self-acting keys, which are easily detached when it is required to open it for the passage of full-sized vessels.

The total width of the roadway, including that for the carriages as well as for the foot passengers, is 7½ metres.

The ends between the piers and the abutments, at the adjoining streets, are filled with the counter-balance weights, which are so regulated as to balance the other two and longer portions, between the piers and the centre of the opening, so perfectly as to enable the rotation to be effected with the least possible friction; and in order to afford ready access for repairs to the rollers, arrangements are made for lifting the entire ring, by hydraulic pressure, within a few minutes.

This bridge may be said to fulfil its purpose admirably, and whilst it forms a convenient and much required communication between the towns

of Brest and Récouvrance, which are situated on either side, it affords free passage for vessels of war under and through it, in consequence of its great height from the surface of high-water to the under-side of the arch.

The original project for this great work is due to Messrs. Cadiat and Oudry, to whom a collective medal has been awarded as the authors of the original project, and for its boldness and unique character; but the actual structure was designed and constructed by M. Mathieu, the able engineer of the Creusot Iron Works, and by Messrs. Schneider and Co., who were the contractors for the work. The erection of the structure was superintended by Messrs. Maitrot de Varennes and Aumaitre, engineers-in-chief of bridges and roads, and M. Rousseau, engineer.*

The next bridge most worthy of remark is that erected over the valley of the Sarine, on the line of the Fribourg and Lausanne Railway. It was designed and constructed by M. Mathieu, the engineer for the Creusot Company, who were the contractors for the work, and at whose establishment it was all manufactured.

The total length of this bridge is nearly 329 metres, and it consists of seven openings, of nearly 49 metres each, supported upon six cast-iron piers, composed of diagonal-framed panels, firmly braced together by wrought-iron rods placed diagonally. The openings are spanned by wrought-iron girders, upon the trellis principle; the highest pier in the deepest part of the valley being 80 metres in height, of which the upper length of 44 metres is in metal, so that in point of economy it became an object of the greatest importance to avoid the construction of scaffolding, which would have been attended with considerable expense; this was happily effected by a very ingenious and novel system. The lattice girders, with the platform forming the whole width of the bridge, were, in the first instance, constructed; or put together on one of the adjoining abutments, and placed upon rollers, over which they wers drawn forward until the end overhung the position at the first pier, having sufficient counterbalancing weights at the ends to prevent them from falling as they were moved onward. As a further precaution against this danger; the ends were stayed by chains and rods of wrought iron, attached to strong derricks, or cranes fixed upon the piers, provided with proper machinery for hauling them along, so that in proportion as they advanced the chains were shortened, until the ends of the girders reached the point over each pier. The panels for forming the pier were then brought forward upon the girders and platform, and were lowered to their position; so that the structure, in fact, grew up beneath the girders, which were then again drawn forward over the piers, and the same process was repeated until the whole bridge had been drawn across, when the platform was securely fixed in its position. By means of this novel, simple, and ingenious contrivance, this bold aud economical railway bridge, or viaduct, was most successfully constructed, to the great credit of the Creusot Iron Company and their able engineer-in-chief, M. Mathieu, inventor of the method of construction and builder of the bridge, to whom the Jury have awarded a medal, with the expression of their highest satisfaction for the invention and successful application of the method employed in the construction; and they thought it right to give an honourable mention to M. Clerc, for the excellence of the model of the bridge, exhibiting the mode of construction.

A road bridge, called the "Pont de St. Just," across the mountain torrent, the Ardeche, upon the same principle, with stone piers, was designed originally by M. Oudry, and constructed by the Creusot Iron Company, under the immediate direction of M. Mathieu, with equal success. This bridge, which consists of six spans of 46·26 metres each, was also remarkable for the obstacles encountered, not only in constructing the piers, in consequence of the extreme violence of the torrent during floods, but because it was absolutely necessary to provide a means of placing the wrought iron arched girders, without having recourse to the ordinary mode of fixing scaffolding beneath. This was accomplished by having a counterbalanced scaffolding, which was propelled forward from the abutment over the piers consecutively, having on it the means of raising the arched iron girders to their places on the piers. This was very successfully accomplished, without accident; and the award of a medal would be justly due to M. Mathieu, the engineer-in-chief of the Creusot works, to whom were entrusted all the details of the construction of this work, if he had not gained one for the bridge of Fribourg.

The next viaduct bridge worthy of remark is that over the Rhine, at Kehl, for connecting the Eastern Railway of France with the German system of railways at Strasbourg.

The execution of this great work was, by mutual consent, apportioned between the engineers of the Eastern Railway, who undertook the construction of the foundations and the piers, and the engineers of the Grand Duchy of Baden, who were charged with the execution and fixing of the superstructure. The foundations and the mode of executing them were designed and executed by M. Vuigner, engineer-in-chief, and Monsieur Fleur-Saint-Denis, resident engineer, with M. de Sappel, acting engineer; and their designs were carried into effect with great intelligence by the enterprising contractors, Messrs. Castor.

The general features of this viaduct are, masonry piers, supporting a superstructure of wrought-iron girders, on the trellis principle, with a lifting, opening at each extremity, to permit the passage of the masted vessels which navigate the Rhine.

The principle difficulties in the construction of this bridge arose from the depth of the river, the rapidity of the current, and the shifting nature of the bed, which, being composed of loose gravel, was at times scoured away to the depth of many feet; so that no bridge could be rendered permanent, unless the foundations of the piers were carried down to a depth below the action of the current. In order to effect this it was necessary to resort to extraordinary measures. This was effected by the employment of large wrought-iron caissons, placed side by side, so as to cover the entire space of the pier. These contained air cylinders, with valves in them rising from the top of the caissons to above the level of the water, and a large cylinder, open at both ends, having its lower extremity descending below the edges of the caisson. Within this latter cylinder was fixed a dredging frame and buckets.

To be continued.

* It would have been proposed to award a medal to M. Mathieu for this important work, but it was reserved for the design and execution of the Bridge of Fribourg, which are scarcely, if at all, less ingenious and successful than those of the Bridge of Brest.

NEW REGULATOR FOR TEMPERATURES.

A committee of the French Academy of Sciences reports very favourably of a new automatic temperature regulator which M. Eugene Rollaud has attached to his mechanical roaster, and which, the committee say, has worked for eight years with the precision of a piece of physical apparatus and the certainty of a practical machine. The combustion of the furnace is regulated by balance valves on the pipes through which the air is introduced, which valves are automatically governed by the regulator. This regulator consists of a mercury gauge, the closed branch of which is attached to a fixed support, while the cistern is freely suspended to the beam of a balance; the varying weight in this branch will cause the beam to assume different positions depending on the temperature of the apparatus, which variation of position may be used to govern the valve. In order to prevent the barometric changes from affecting the apparatus, the closed end of a syphon barometer, the tube of which is of the same diameter with the gauge, is attached to the beam, while its cistern is sustained by the fixed support. The barometric changes will then affect these two instruments equally and in opposite directions, and will, consequently, have no effect on the position of the balance beam.—*Comptes Rendus of the Academy of Sciences.*

Legal Intelligence.

Court of Queen's Bench, Guildhall, Dec. 12.—Kottula v. Palmer and others.—Mr. Bovill, Q.C., Mr. Webster, Mr. Joseph Browne, Q.C., Mr. Macrory, Q.C., appeared for the plaintiff; Mr. Macavc, Q.C., Mr. Hindmarch, Q.O., and Mr. Aston, were for the defendants.—This was for an action by the assignee of Messrs. Blake and Maxwell's patent for improvements in the manufacture of soap, dated August 30, 1856, against Messrs. Palmer and Co., the well-known patent candle and lamp makers.—After the time of the court had been occupied nearly two days, some witnesses for the defendant proved that soap, precisely the same as that, the making of which was alleged to be an infringement of the plaintiff's patent rights, had been made from a recipe in Kurten's book upon the subject before 1856, and soon after that work was known in England in 1853.—Mr. Bovill elected to be nonsuited.—The Lord Chief Justice said the case furnished another proof of the unsatisfactory state of the law as to patents.—Plaintiff nonsuited accordingly.

At a meeting of the Judicial Committee of Her Majesty's Privy Council, Whitehall, Saturday 15th of November, 1862—in the matter of the prolongation of Goucher's patent—the following judgment was delivered by Lord Justice Knight Bruce:—"Their Lordships are of opinion upon the evidence before them, that the invention now in question has been shown to be meritorious and beneficial, and subject to the observations and conditions to be presently mentioned; they are of opinion that there should be an extension of the term granted by the letters patent for three years from the time of its expiration. But their Lordships are not at present satisfied with the accounts, or with the evidence as to the amount of profit or loss that has followed from the invention, and they are desirous therefore, that the accounts, in an improved and extended state, if possible, should be laid before the Attorney General, if he will have the goodness, as probably he will, to undertake the matter, in order to satisfy him of what is a fair and correct view upon all the evidence which can reasonably be expected to be obtained of the amount of profit or loss from the invention. Their Lordships think that unless the amount of clear profit made by the invention shall be found to exceed £2,000, the extension already stated ought to take place, but, that if the clear profit shall be found to exceed £2,000, the extension ought not to take place. They do not think that, in calculating the amount of profit, the gains made by those who have had a license from the patentee, gains in which neither he nor the inspector, nor the mortgagee has participated, should be taken into account. In one possible view of the Statute Law upon the subject, it may be important that the opinion of the Attorney General upon the accounts should be given as speedily as it can be, if he will have the goodness to take charge of the matter. Their Lordships also think that there should be an undertaking on the part of the applicant to give the mortgagee and the inspector the same rights beneficially in the extended term as they now respectively have in the present letters patent."

At the annual general meeting of the Institute of Civil Engineers, on the 16th inst., Telford medals were presented to Sir Charles Augustus Hartley, Messrs. J. H. Muller, J. Paton, J. Abernethy, and J. Bailey Denton; a Watt medal to J. D'A. Samuda: a Stephenson prize of twenty-five guineas to Sir C. A. Hartley; Miller prizes, of fifteen guineas each, to J. H. Müller and J. Paton; council premiums of books to Capt. Douglas Galton, R.E., and Messrs. J. Brunlees, H. C. Forde, C.W. Siemens, J. A. Longridge, and J. Oldham; and the Manby premium, in books, to Sir C. A. Hartley. The following gentlemen were elected to fill the several offices of the council of the Institution of Civil Engineers for the ensuing year:—John Hawkshaw, president; J. Fowler, C. H. Gregory, J. R. McClean, and J. S. Russell, vice-presidents; Sir William Armstrong, N. Beardmore, J. Cubitt, T.E. Harrison, T. Hawksley, G. W. Hemans, J. Murray, G. R. Stephenson, C. Vignoles, and J. Whitworth, members; and J. T. Leather and F. Marrable, associates.

ANNULAR KILNS FOR BURNING BRICKS, LIME, EARTHENWARE, ETC., WITHOUT STOPPAGES.

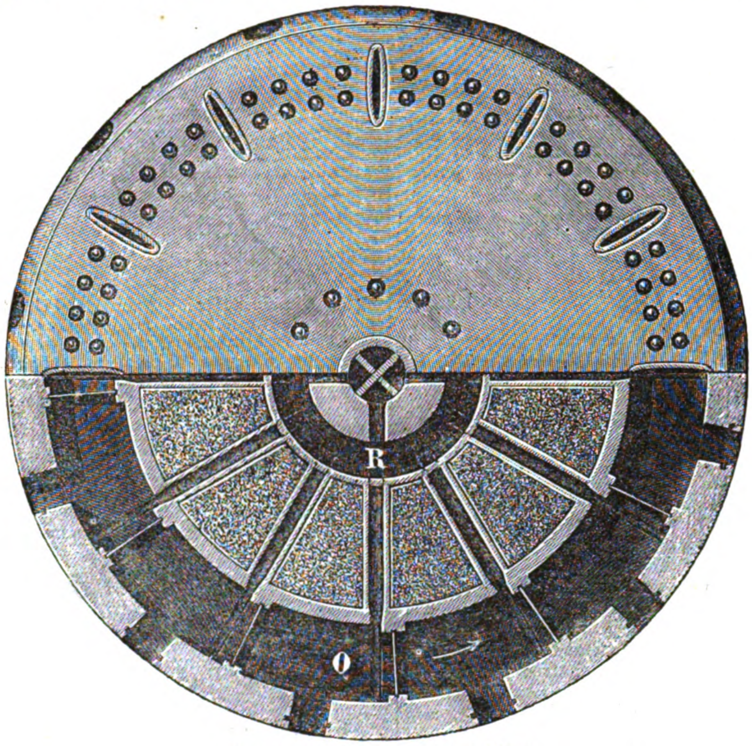


FIG. 1.—PLAN OF ANNULAR KILN.

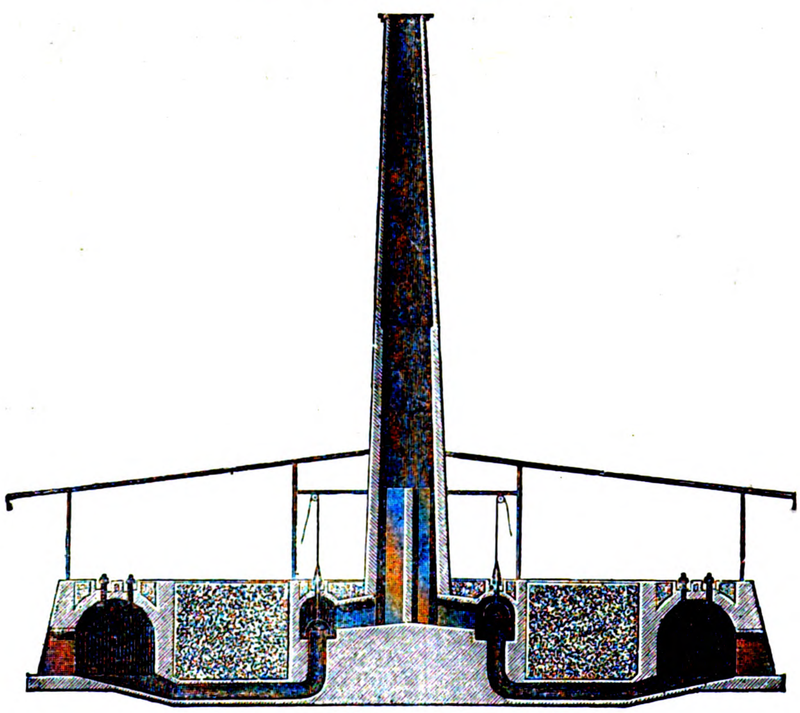


FIG. 2.—SECTIONAL ELEVATION OF ANNULAR KILN.

ANNULAR KILNS FOR BURNING BRICKS, LIME, EARTHENWARE, ETC., WITHOUT STOPPAGES.

IT is, of course, of great importance in the manufacturing of bricks, lime, pottery, &c., to reduce the consumption of fuel, and also to produce good articles in the shortest space of time. There exist already a great many improvements in the construction of furnaces, none of them, however, lead to very great economy, combined with simplicity in arrangement, together with the ready manipulation required. The Annular Furnaces of Messrs. Hoffman and Licht are said to work with much economy of fuel, saving in time, and the process of firing would not seem to require very skilled labour. This invention is, we believe, patented in Great Britain, France, Germany, and Belgium.

The annular form is adopted for these furnaces because it here affords the greatest strength. The furnace consists of a circular channel, O, of any section, which receives the articles to be fired, which articles are let in through doors in the outer wall, as shewn, or by apertures formed in the top of the arch. Flues, of the same number as the doors, lead from the bed of the furnace to the smoke chamber, R, which surrounds the base of the chimney stalk. The communication can be shut off when required by means of cast-iron bell-shaped covers. A damper, which is moveable along the furnace, can be lowered in grooves let into the walls of the furnace, immediately after each flue, so as to separate the horizontal section of the furnace into distinct and equi-distant compartments. The fuel passes through apertures which are formed in the top of the arch—thence through channels, which are formed by the objects to be burned, to the bed of the furnace in which a certain number of flues are cut to produce a free current to the fire in all parts.

There may be, for instance, twelve entrances or doors—in consequence of which, there are the same number of flues communicating with the chimney stalk, and just as many slits in the arch for the reception of the plate damper. Thus the furnace may be divided into twelve parts. For a better distinction, these compartments may be numbered from one to twelve, of which two, No. 12 and No. 1, are separated by the damper.

FIG. 3.—DIAGRAM SHOWING MANIPULATION.

The objects supposed to be burned may be bricks or tiles, and the fire in full operation; the doors leading to the compartments 1 and 2 being open—No. 1 for filling them with fresh bricks, and No. 2 for taking out the burned bricks. The compartments, Nos. 3, 4, 5, and 6, which are all filled with burned bricks, being gradually cooled by the air entering through the doors of No. 1 and 2, and passing over warmer and at last glowing bricks, it will result that the fire is supplied with atmospheric air almost as hot as the furnace itself. In the compartment, No. 7, is the burning fire; and when its contents are ready burned, the contents of No. 8 will already be heated to such a degree that the fuel introduced from the top is instantaneously inflamed. The compartments, Nos. 9, 10, and 11, will be heated one after another by the hot air which passes and imparts the heat to the contents of these compartments, and then rushes into the last compartment, No. 12; the air is then caused to escape through the open flue into the chimney by pushing down the damper. No. 1 is then filled again, the damper between 12 and 1 is lifted and lowered between 1 and 2. The bell above the mouth of the flue No. 12 must be lowered, and that of No. 1 lifted. The opening *b* of No. 12 must then be closed, and that of the compartment No. 3 opened; the contents of which will be sufficiently cooled to be taken out, while No. 2, which is empty, can be filled again. It is thus possible to burn bricks or lime, and to fill or empty the furnaces at the same time, and without interruption.

The advantages claimed for the arrangements described, as compared with the old plan, are as follow:—The atmospheric air necessary for the support of the fire absorbs the heat of the ready burned bricks, and supplies the fire of the furnace with hot air. On the other side the superfluous heat contributes to the gradual heating of the bricks to be burned, so that no heat is lost except that in the hot air necessary for keeping up the draught in the chimney-stalk. The furnace and walls are coated with non-conducting material, and the whole structure is insulated by plates of asphalte under the foundation, by which means the escape of heat is reduced as much as possible. The apertures through which the furnace receives the combustibles are in consecutive communication with each other, so that at any time the state and progress of the fire in the furnace can be examined and regulated. The charg-

EMERY'S AMERICAN THRASHING MACHINE.—(*See page 395.*)

(*See page 395.*)

FIG. 1.

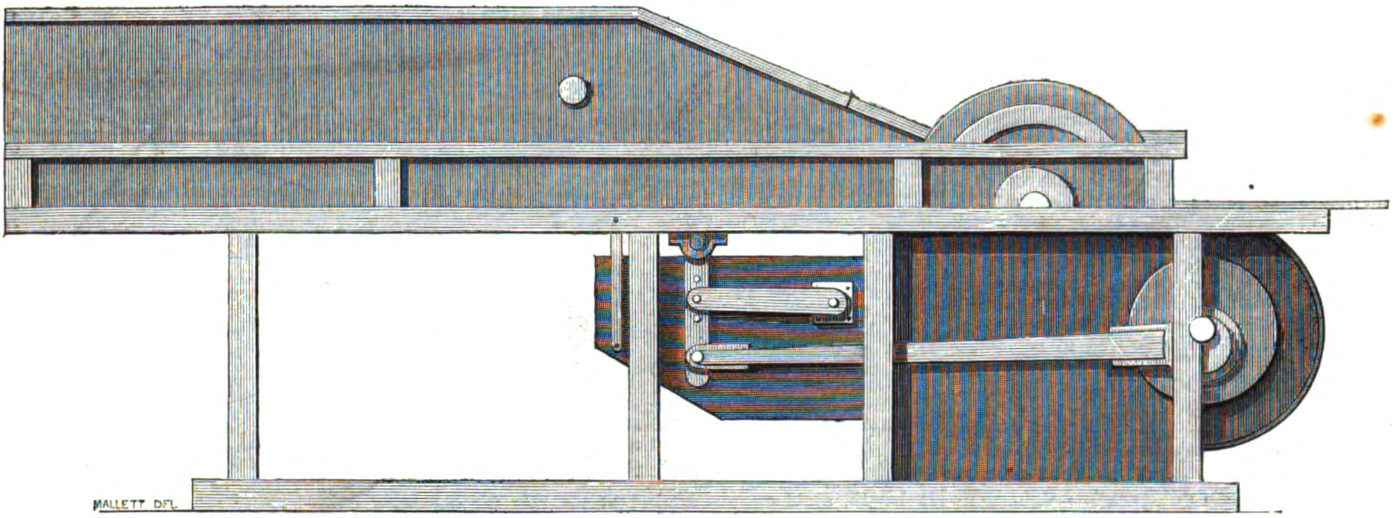
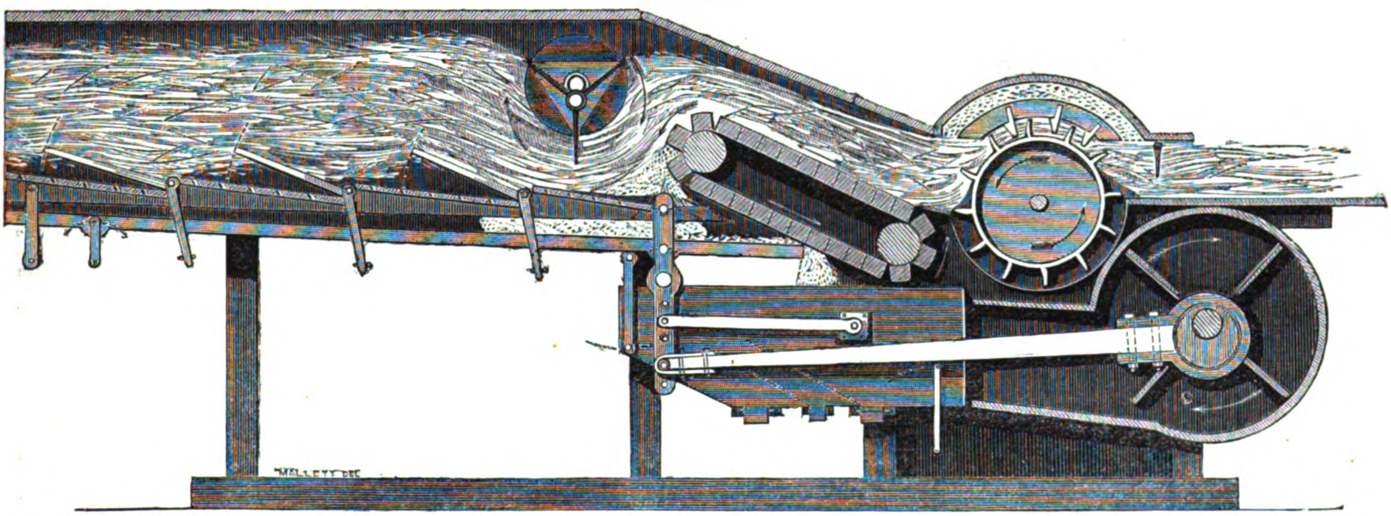


FIG. 2.



ing and emptying of the furnace can be done at the same time, and without interruption, and it is not necessary to wait for the bricks to cool. A saving is also effected in building the furnaces as compared with those of the old construction. For the production of the same large quantity of bricks in the old kilns, it would necessitate a number of furnaces being employed. The height of the furnace scarcely exceeds that which a man can reach with his hands, and thus greatly facilitates the putting in and taking out of the articles to be burned. The compartments of the furnace are constantly emptying in succession, and the repairs can thus be done without stopping the whole furnace. As the combustibles are thrown into compartments already very hot, any inferior sort of fuel can be used. The furnace seems to be adapted for burning lime, cement, and firing pottery-ware as well as bricks, because the draft can be regulated and the heat thereby increased or diminished.

The cost of these brick kilns varies between £500 and £2000, according to size and local circumstances. We have seen testimonials shewing that these furnaces are at work at several places in Germany.

CAPTAIN JOHN HARVEY.—A short account of Navez's Electro-Ballistic apparatus (the machine in use at Shoeburyness, for determining the initial and impact velocities of projectiles), is to be found in the "Lectures on Artillery," by Major Owen and Captain Dames. It was also briefly described in our number for Dec. 5.

THE BATH SCHOOL OF ART.

ON the 26th ult., the annual distribution of the prizes, in connection with the Bath School of Art, took place at the Guildhall, in that town.

The Rev. E. D. RHODES, in opening the meeting, gave a very interesting and instructive address upon the progress of the society, and the importance of similar schools generally. He especially advocated the connection of

BEAUTY AND USEFULNESS

in all buildings. He believed it was Smeaton who had to construct the Eddystone Lighthouse at Plymouth, and his attention was directed by his scientific training, not by the artistic training which he had received to the stem of a tree. It struck him, "Now this tree—this creature that I am looking at there, has a tremendous strain upon this pillar which supports that large amount of branches above, and those branches are swayed by the force and violence of the winds, so that there must be, as any architect would observe, some peculiar fitness in the form of the pillar to support, not merely the incumbent weight which is always pressing upon it, but also the extraordinary strain which the storm and tempest engender. I want to erect a building something after the character of this stem—an upright, tall, slender building, proportionable, which is to encounter the storms, and tempests, and violence that assails this tree. Would it not be wise to copy the stem of the tree in the building I am going to erect, that peculiar curve which the stem takes from the ground up to the point of ramification; that gradation and that gentle diminution?" Smeaton did so, and built the Eddystone Lighthouse upon that principle. Storm and tempest had assailed it with as much severity as anything that had been there before, but although other buildings of a similar kind erected there had been overthrown one after another, Smeaton's structure still stood untouched and unhurt. Now here was an instance, they would say, of the perfectness of contrivance of infinite wisdom, which adapted all forms of creation to the ends of creation; but was there not also an instance of beauty? Look at the stem of a tree and conceive, if they could, any form that supported a head above it more beautiful than that—conceive any tapering form more exquisitely contrived and more gradually diminished upon a principle of curvature, more perfect, scientifically, as well as artistically. It presented to them a strong instance of how beauty was connected with use. He would give them another instance. There could be little doubt that in sculpture, at least, the form of the human head was as beautiful a thing in its place as could possibly be conceived. We need only take the skull of the gorilla, or of any other animal in existence, and put it upon the human neck, and they would see how vastly the human form had lost in beauty by that change in the form of the skull. Here, then, was another model of beauty. He believed it was a fact upon record that when either Sir Christopher Wren or Michael Angelo (he thought the former) had to build the dome of St. Paul's, or if Michael An-

gelo, the dome of St. Peter's, it occurred to him that there could be no domed form more adapted to strength in proportion to material than that of the human skull; that the evident necessities of the skull of the head would be, that it should have as much strength as could possibly be commanded with the necessary lightness; that the material which formed the bony structure of the skull should be so arranged as to combine the greatest possible strength for the purpose intended, which was to preserve the life of man; and accordingly that the curvature of the dome should be such as would offer the greatest resistance to any violence or any pressure from without, and which should endure the greatest weight which could be borne upon such a texture. In short, that the form of the dome of the skull was the most serviceable and the most useful to adopt, and the thing was proved to be mathematically true.

The prizes were distributed, and several votes of thanks carried.

TO CORRESPONDENTS.

RECEIVED.—W. A.; the papers are returned by post; R.N., P. Le N.F., J.S.P., J.H.D., R.P., J.H.P., W.W., Capt. B.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of his good faith.

Correspondence.

[*We do not hold ourselves responsible for the opinions of our Correspondents.*]

STEAM PLOUGHING.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—Allow me a word on your remark "Messrs. Howard seem to have improved Mr. Smith's invention off the face of creation," in your article on the Smithfield Club Show. If my not exhibiting my inventions in the newly created Hall can prove the point, it may be true; but it is not so; for I have 188 customers who are working them most successfully. Here is a brief history of the working of one set.

Mr. Pike, of Stevington, Beds, bought a set in May, 1858, and worked it on his heavy clay farm down to the spring of 1861, and, according to his own showing, did over 2,000 acres with it. He then adopted what is called Howard's improvements, and sold his set of mine to Mr. Hutchinson, of Manthorpe Lodge, Grantham, who worked it upon the Dunton Lodge Farm, near Biggleswade, a very heavy clay farm, from the spring of 1861 to now, and, according to his own showing, did, in 1861, 751 acres in 133 days, averaging 5a. 2r. 23p. per day, at a cost of 4s. 6d. per acre, exclusive of wear and tear, and in 1862, 775 acres in 131½ days, averaging 5a. 3r. 23p. per day, at a cost of 6s. 2d. per acre, inclusive of wear and tear, with interest &c. The set of tackle is now reported to be, in appearance, as good as when it was first worked at Dunton Lodge, and Mr. Pike wrote on Dec. 31, 1860, that it was very little the worse for wear.

Surely this does not show that my inventions are improved out of creation. The fact is, the evidence is daily strengthening on these sides, and it may be that they will outlive the said to be improved tackle of both Mr. Fowler and Mr. Howard, neither of which can show land cultivated and planted at one operation by their inventions, although I can, and at a cost of only 6s. per acre, inclusive of wear and tear.

I am, &c.,
WILLIAM SMITH.

Woolston, Bletchley Station, Bucks,
Dec. 13, 1862.

THE ATLANTIC TELEGRAPH COMPANY'S SCHEME.

SIR,—In ordinary enterprizes it is a matter of little public moment whether men part with their money wisely or foolishly. In the one case they will receive the congratulations of their friends for their success, and will be able to contemplate with satisfaction an increase in their means of enjoying life; in the latter they will be laughed at for their folly, and must bear the loss of their money with the best grace they can; but the public, generally speaking, are in no way interested in the result. Not so, however, when the failure may prevent the realization of a great boon to the whole world, such as must be derived by telegraphic communication between Europe and America. It is for this reason I have ventured to make some reflections with respect to the present attempt of the old Atlantic Company to resuscitate their enterprize. If they fail, the result would be a death blow to the well-grounded hopes of success, which other routes claim to have upon public support.

The Atlantic Telegraph Company have announced their intention of inviting the public to lay out £600,000 of new capital, the nett proceeds of which, should they be fortunate in laying the cables, they estimate at £413,000 per annum, producing 18 per cent. upon the new capital, 14 per cent. upon the £402,860 of old capital previously expended, and leaving after all a balance for reserve fund of £240,200 per annum! The rate of working upon which this estimate is based appears to have been derived from the united experience acquired upon two short shoal-water cables in the North Sea, and is altogether at variance with the opinion of the* first electricians of the day, and with the laws derived from the actual working results of longer lines, which show that the speed of signalling is reduced inversely as the square of the length of the cable. Hence it was that the line formerly laid between Newfoundland and Ireland, 2,200 miles in length, could only be worked at the rate of about a word a minute; and for the same reason the Government recently, in laying the Malta and Alexandria cable, divided the length into three sections, intermediate stations being opened at Bengazi and Tripoli, not (as the Atlantic Telegraph Company have the hardihood to maintain) for the sake of the few pounds of annual traffic to be got then, but to enable the line to be worked through at a commercially paying rate, which could not be effected with the slow speed of working through the entire length of the line in one circuit. This is one of the greatest objections to the long route, and the company seem not altogether ignorant of it themselves; for, although they estimate their traffic so liberally, they state that their preference shares are to be guaranteed 8 per cent. dividend from the Government "in the event of success." It would appear from this, that if the line, being once laid, could only convey a message per day, the Government would have to pay the working expenses of £25,000 a year, and £48,000 dividend on the preference shares. The estimate of receipts to which I have referred is calculated by the company upon an uninterrupted rate of working of 10 words per minute for 16 hours out of 24, or 480 messages a day, which is assumed to be a moderate expectation, because 1,500 messages are said to be passed daily between this country and the Continent. It must be remembered, however, that the Continental traffic spoken of is spread over no less than 35 conducting wires, none of which are so long as to be materially subject to the retardation and confusion of signals by inductive phenomena, which are so prejudicial to the well-working of lines of great length. When the Government are applied to for assistance in the construction of a line of telegraph to America, which will no doubt be the case before long, as no less than three distinct undertakings are in the field, it is most earnestly to be hoped, in the interests of the public, that the whole matter will be referred to a competent committee to investigate. It will then be determined whether the direct line, with its enormous large stretch in one single risk, and its great electrical obstacles, affords the best promise of success, and is most worthy of aid from the public purse; or whether the several other routes in shorter sections by the Northern or Icelandic route, by the Azores, by the Canary and Cape Verde Islands and Brazil, or by the Aleutian Islands and British Columbia, are not, any or all of them immeasurably superior to the line between Ireland and Newfoundland?

I am, &c.,
GEOGRAPHER.

London, Dec. 11, 1862.

* Why did our correspondent not specify the authorities?

SIR,—There are two errata in the letter which I addressed to you in the last week's number of your MAGAZINE, which, if not corrected, your readers could make any sense of the sentence in which it is placed; for "cotter" read "latter," and for "screw" read "screen."

Having corrected the mistakes, I covet a small space in your MAGAZINE to offer some further remarks about the fin.

In reconsidering what I had stated, that its greatest turning power would be obtained by placing it the fore part of a ship instead of the after part, I still adhere to that point; but I have since reflected how much inferior the turning power of a fin is to that of a fore rudder hinged on the stem of a ship, which I shall endeavour to explain:—1, Its longer leverage from the fulcrum of the ship's turning. 2, That it is now well known that the velocity of fluids acts upon the fore part of plane surfaces (whose pivots are central) with greater force than on the after part, when placed at any other angle than that of a right one, so that a fore rudder would be superior in turning power than an after one, the areas of both being equal. 3, Suppose the fore rudder to be put over to starboard (the helm, of course, to port), it would act as a screen, cutting off the stream, which would otherwise impinge itself upon the starboard bow of the ship, whilst the port bow would be acted upon by the full force of the stream, thus giving its aid to the turning power of the rudder; for if, by *imagination*, a force be supposed to act upon the port bow of a ship, whilst none existed on the opposite one, why a ship would turn without any rudder whatever. On the other hand, a fin, when put over on the starboard side, would screen the current which would otherwise be acting on the starboard bow of the ship, and thus the power of the fin would be diminished, instead of being aided, as in the case of the fore rudder. I do not here discuss how the fore rudder is to be managed or worked, that being quite another affair. But as I have learnt that my Lords of the Admiralty have ordered experiments to be tried on ships fitted with two rudders, it may be useful, by way of arriving at some glimpse of truth by theory, before it ends in practical disappointment.

I am, &c.,
MOLYNEUX SHULDHAM,
Comm. R.N.

21, Wellington-villas, Brighton,
16th Dec., 1862.

SIR,—In your number of December 12th, you were good enough to answer, by an extract from the *Journal of the Franklin Institution*, a question of mine concerning the penetration of projectiles into iron, but as my note did not convey to you the exact purport which I had intended, I venture again to trouble you on the same subject. In the dissertation on "Vis Viva," from the *Journal of the Franklin Institution*, it is *assumed* that in impact "*the amount of compression is directly proportioned to the square of the velocities.*" If this were so with all natures of bodies, penetration would, of course, be proportionate, or nearly so, to V^2. But experiment has shown that the penetration into some substances does not vary as V^2. Very few investigations into the theory and practice of penetration are known to the public; but experiments made by Dr. Hutton, and in France, showed that the penetration of projectiles into wood, into earth, and into masonry, instead of varying with V^2, vary nearly as the logarithm of V^2. This being so, you will, I think, allow that there is reason to doubt the correctness of the $W V^2$ theory, as it concerns penetration into iron, until facts are advanced to prove that for this material it holds good.

The $W V^2$ theory can be correct only if the resistance to penetration is a constant force. Adopting ordinary mathematical notation, if R be the resistance to penetration of a projectile moving with velocity V, by calculus

$$f = -R : f\ v\frac{dv}{dx} = -R \therefore v\,dv = -R\,dx$$

$$\text{Integrating } \frac{v^2}{2} = -Rx + C;\ \text{If } x = 0,\ v = V.$$

$$\frac{V^2 - v^2}{2} = Rx,\ \text{if } v = o,\ x = \text{total penetration}$$

$$x = \frac{V^2}{2R},\ \text{or } x \text{ is proportional to } V^2,$$

but this is only the case when R is a constant force. The question then that naturally follows: "*Is* the resistance to penetration a constant force" in the case of iron? How has it been ascertained that it is so? By experiments showing that penetration varies as $W V^2$? or by independent reasoning and experiment on the molecular resistance of iron? Could you inform me if any experiments have been undertaken to elucidate the theory, and if any work or treatise has been published on this particular subject.

I am, &c.,
IRON.

Dec. 13, 1862.

Strong brown paper is now manufactured at the Salisbury Paper Mills, in Orange county, from "cat tails," the product of the wild flag growing in low grounds all over the North.

Meetings for the Week.

MON.—*London Inst.*, "On the House of Commons, Horace Walpole, and Modern Satire," by Shirley Brooks, Esq., at 7 p.m.
FRI. — *Architectural Assoc.*, Prize Essays.
SAT. — *Royal Inst.*, "On Air and Water" (juvenile lecture), by Professor Frankland, F.R.S., at 3 p.m.

Gossip.

Elias Howe, jun., the inventor of the sewing machine, carries the daily mail from Washington to the camp of the 17th Connecticut Regiment, in which he is a private.

CUT OFF THE BACK LEGS OF YOUR CHAIRS.—I will tell you a secret worth knowing. A thousand things not worth half as much have been patented and elevated into a business. It is this: If you cut off the back legs of your chairs, so that the back part of the seat shall be two inches lower than the front part, it will greatly relieve the fatigue of sitting, and keep your spine in better shape. The principal fatigue in sitting comes from your sliding forward, and thus straining the ligaments and muscles in the small of the back. The expedient I have advised will obviate this tendency, and, as I have suggested, add greatly to the comfort and healthfulness of the sittting posture. The front edge of a chair should not be more than fifteen inches high for the average man, nor more than fourteen for the average woman. The average chair is now seventeen inches high, for all, which no amount of slanting in the seat can make comfortable. *Lewis's Gymnasium.*

WIRE-ROPES.—An invention has been patented by Mr. Geo. Bedson, of Manchester, which consists in the employment of flat wire in the manufacture of wire-rope. In preparing wire for ropes he causes it after it passes hot from rollers to be wound on a drum, thus affording two points of suspension, between which he cools it, and so causes a contraction, by which the material becomes straightened.

NATIONAL EXHIBITION IN TURKEY.—We have received from the Ottoman Embassy the following notification:—A National Exhibition is to be opened at Constantinople on the 1st Ramazan (20th Feb., 1863), for three months. Although reserved exclusively for the products of the soil and industry of the country, nevertheless agricultural and industrial machines and implements, for practical use, from foreign manufactories, will be admitted. Manufacturers wishing to exhibit such articles will enjoy the benefit of a remission of the customs duties. It is well understood that the admission of foreign products will be limited to this sole category, and that a manufacturer cannot send more than one article of the same kind. Exhibitors must, in the first place, send to the Imperial Ottoman Embassy, or to a Consulate of the Sublime Porte, a duplicate list of the articles they wish to exhibit, stating the quality, quantity, and necessary dimensions, so that places may be reserved for them. The articles above-mentioned which, after having been exhibited, shall not have been sold on the exhibitor's account, will not enjoy any other advantage on the part of the Imperial Government than the exemption from customs duties.

GUN METAL.—A correspondent of *The Times* says:—As the public is now much interested in gunnery, and as a short statement on recent experiments in Austria on this important subject has just appeared in *The Times*, I have pleasure in communicating to you the composition and mode of forming the new alloy which has been proposed in that country as a substitute for ordinary gun-metal, consisting of copper and tin. It is composed of 60 parts of copper, from 34 to 44 of spelter, from two to four of iron, and from one to two of tin. The iron, which must be wrought iron, is put at the bottom of a crucible with the copper upon it, and the whole exposed to a very high temperature. The tin is then added, and afterwards the spelter. The metal is stirred, left for a minute or two, stirred again, and afterwards cast. A 12-pounder gun made of this alloy was heavily charged with powder, rammed full of sand, plugged at the muzzle with a piece of iron, and in this state fired. All the gas resulting from the ignition of the powder escaped through the touchhole; and not only was the gun found to be uninjured, but on careful examination not the smallest alteration in its internal diameter could be detected. This indicates extraordinary toughness and elasticity. The preceding information has been personally communicated to me by the inventor with full permission to disclose it. I do not know whether the alloy has been patented or not in this country. I have no doubt that the announcement of these details in your columns will soon induce competent persons to test their accuracy.

ORIGIN OF PETROLEUM.—The flow of oil from mineral springs is by no means new either to science or commerce. Herodotus has recorded that the island of Zante furnished large quantities, while Pliny and Dioscorides describe the oil obtained from Agrigentum, a small town in Sicily. The Persian springs at Bakoum have yielded to the value of 600,000 dols. annually; and the earth oil from Rangoon, in Burmah, has been exported to the extent of 400,000 hogsheads yearly. The streets of Genoa and Amiens were formerly lit by a petroleum obtained from Parma. In 1847, a spring was discovered in Yorkshtre, which was successfully worked by Mr. James Young, of Glasgow, until exhausted, when he turned his attention to the distillation of coal, and discovered paraffin oil. The marvellous oil springs of the New World, however, far surpass in extent and interest all previous discoveries, and the quantity already yielded, without apparently diminishing the supply, shows that this will be a most important article of commerce for some years to come. In Canada the oil rises from the saturated corniferous limestones; in the States it is principally obtained from Devonian sandstones, while in Western Virginia and Ohio it rises directly from the coal measures. In all cases it, no doubt, arises from the decomposition of coal by temperature and pressure, and is lifted by the percolation of water under it to cavities and fissures in rocks till it approaches the surface, and it is generally accompanied by quantities of coal gas.—*Dr. J. B. Edwards.*

The iron-clad steamer "Passaic" has at length reached her destination at Fortress Monroe. The buoyancy of the vessel is said to have been very good. Owing to the impossibility of making the usual arrangements to prevent water coming in at the junction of the turret with the deck, it was thought that much inconvenience would be felt from this cause. The ship answered her helm satisfactorily, but the present steering wheel will be removed to make room for a larger one. The deviation of the compass was about one quarter of a point.—*Scientific American.*

SINGULAR SHOT.—At the Navy Yard, a short time since, an experiment was made with a 10-inch Dahlgren (smooth-bore) gun. A solid shot, weighing 130 lb., was thrown at an iron-clad target, at a distance of 500 yards, perforating the iron plating, 4 in. thick, as also 10 in. oak planking, passing out on the other side. The plating was torn into fragments, one piece flying backward into the joiners' shop, 200 yards in the rear of the gun, and 700 from the target.—*National Intelligencer.*

WATERPROOF WALKS.—But a new method of path-making is fast coming into vogue, and will soon be universally adopted for its cheapness, general excellence, and permanence; in fact, when once well done, it lasts for ever. Instead of making the walk of loose material, on the old fashion, concreting is resorted to, by which the appearance of gravel is retained, with all its freshness and beauty of contrast to grass and flowers, and the walk itself is rendered as dry and durable as the best pavement. The *modus operandi* is as follows:—Procure a sufficient quantity of the best Portland cement, then with the help of a labourer turn up the path with a pick, and have all the old gravel screened, so as to separate the loam and surface weeds from it, and to every six parts of the gravel add three parts of gritty sand of any kind—but soft pit sand is unsuitable—and one part, by measure, of Portland cement. When these are well mixed together in a dry state, add sufficient water to make the whole into a moderately stiff working consistence, and lay it down quickly two inches thick on a hard bottom. A common spade is the best tool with which to spread it; it must be at once spread, as it is to remain for ever, and a slight convexity given to the surface. In 48 hours it becomes as hard as a rock; not a drop of rain will go through it; and if a drop lodges on it, blame yourself for not having made the surface even—but a very moderate fall is sufficient with such an impenetrable material. Not a weed will ever grow on a path so formed; not a worm will ever work through it; a birch broom will keep the surface clean and bright, and of course it never requires rolling. It is necessary to be very particular as to the quality of the cement, for a great deal of rubbish is sold under the name of real Portland. Those who find any difficulty in procuring the genuine thing should apply to Messrs. White, of Millbank, Westminster, who are extensive manufacturers of this and other similar preparations, and can in every way be depended upon. For the flooring of a greenhouse, fowl-house, potting-shed, or barn, this is the best and cheapest that can be had—always clean, hard, and dry, and never requiring repairs of any kind if carefully put down in the first instance.—*Gardener's Weekly Magazine and Floricultural Cabinet.*

SHOWING THE WAY TO DO IT.—On the first day of trial with the flat-headed steel bolt, slightly cupped in its face, after the manner of a steel punch, for piercing holes in boiler-plates, against the iron boiler-plate, three-eighths of an inch thick, the face of the bolt was upset or bulged out by the force of the impact, and the plate, in consequence, was only indented. Mr. Lecky, C.E. to the Cork and Bandon Railway, told me that the flat-fronted steel bolt only failed in perforating the boiler-plate because it was not sufficiently hardened by tempering. I had it and another hardened, accordingly, and the next day of trial both bolts perforated the boiler plate—one at forty yards distance, the other at sixty yards. Mr. Lecky further stated his belief, that, had the boiler-plate been even half-an-inch thick, the bolts would have perforated it.—*John Norton.*

THE NEW SCREW RAM.—A New York paper states that the "Dunderberg" is being built 378 ft. long, 68 broad, 32 deep, with engines of 6,000-horse power. The hull is built of wood, placed so as to form a solid mass. The decks, sides, and floor are solid, and of a great thickness, so much so that if the figures were given all would be greatly surprised at the amount of wood used in the construction. This enormous wooden hull is heavily plated with rolled iron plates, which cover the entire upper portion of the vessel, and extend six feet below the water line. The weight of this terrible armour is not far from 1,200 tons. The bow of the vessel, for 50 ft. abaft the stem, is of solid wood, with no space between the sides of the vessel, this being covered with iron, forming the most gigantic ram on record, having powers of resistance unequaled in every respect. The sides of this vessel, above the water line, are seven feet thick and of solid wood, added to which is the heavy iron plating. This vessel has two rudders, one at each end, so protected that should one become disabled from any cause, the other can be easily used. The engines will give this vessel a very high speed, so that when she strikes a vessel she would crush through her with perfect ease. Above the main deck the build is very peculiar, but at present cannot be described. In addition to a large casement, containing heavy broadside guns, there will be two of Ericsson's revolving turrets, each containng two 15-inch guns. The naval register puts her armament down at 10 guns, but it will be much larger. The accommodation of the officers and men are to be of a superior kind, large, airy, and as well ventilated as an ordinary ocean steamer, yet giving to them all the necesssary security in time of action. In every respect she will be one of the wonders of the age. She is intended more particularly for harbour defences, but can readily go to sea, as she possesses all the qualifications for buoyancy, &c. She wlll be a most terrible affair, and will defy anything else in the shape of an iron-clad. She is to be finished as soon as circumstances will permit.

THE FIRST ENGLISH STEAMER.—The "Margery" was built at Dumbarton, by the late Mr. W. Denny (father of the eminent firm of shipbuilders of that name, now also in Dumbarton), for Mr. W. Anderson, merchant, Glasgow, and when launched, was christened the "Margery," after his eldest daughter, who named her, and who is still alive, and at present a resident in London. At the close of the year 1814 Captain Curtis was sent by a London company to Glasgow, to negotiate with Mr. Anderson for the purchase of the "Margery," which was effected, the only stipulation made by Mr. Anderson being that the name of the steamer should at no future time be changed; this Captain Curtis agreed to, and the promise was faithfully kept. Captain Curtis took the "Margery" through the Forth and Clyde Canal, and invited a large party of Mr. Anderson's friends to accompany him while passing through the canal, and was most hospitable in his entertainment to them. There remain but two of this party now alive—viz., the lady, after whom the steamer was named, and a clergyman, a friend of Mr. Anderson's. The writer of the article in the *Dumbarton Herald* is quite correct as to his statements of the fear and wonder which the appearance of the "Margery" excited on the coast, while on her passage to England, as well as among the English fleet; in most cases she was supposed to be a vessel on fire. The "Margery" was the first steam-ship that ever sailed in English waters, and made her first trip to Milton, below Gravesend, on the 23rd January, 1815 (see *Journal of the So-*

ciety of Arts, for January 27, 1860). She was ultimately taken to Paris, where not many years ago her timbers were still lying on the banks of the Seine. Mr. Anderson was, therefore, owner of the first steamer that was ever seen in London, and also in Paris; he also owned the first that ever crossed from Scotland to Ireland (viz., the "Greenock," built soon after the "Margery"), which he took to Belfast; he also took the first to Londonderry—the "Princess Charlotte." The late Mr. Anderson was grandfather to the Messrs. Gwynne, engineers, of Essex-street wharves, whose large centrifugal pumping-engine in the International Exhibition attracted so much admiration and attention during the past season.

Wright's Tar-paving.—The many just complaints about the stone paving in the Inner Quadrangle of Somerset House, have at length been listened to. The whole of it has been taken up, and the square covered with Wright's tar-paving, which is said to have been used with success at Woolwich and other Government works. The finishing layer of this material will not be put down until the spring of next year. It will then be fairly open to public criticism, and we shall take the opportunity of describing the process of its manufacture, its advantages, and the effect of weather and continual traffic upon it.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

The Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the Proprietors of this Magazine. Other Papers are hereby warned not to produce them without an acknowledgement:—

Steam Engines, &c., 1514, 1568.
Boilers and Furnaces, 1502, 1528.
Roads and Vehicles, including railway plant and carriages, saddlery and harness, &c., 1519, 1537, 1539.
Ships and Boats, including their fittings, 1503, 1506, 1508, 1524, 1527, 1531, 1534, 1535, 1561.
Cultivation of the Soil, including agricultural implements and machines—*none*.
Food and Beverages, including apparatus for preparing food for men and animals, 1510, 1520.
Fibrous Fabrics, including machinery for treating fibres, pulp, paper, &c., 1499, 1501, 1509, 1513, 1529, 1538, 1554, 1555, 1556, 1559, 1560, 1565, 1566.
Buildings and Building Materials, 1512.
Lighting, Heating, and Ventilating, 1523, 1564.
Furniture and Apparel, including household utensils, time-keepers, jewellery, musical instruments, &c., 1504, 1522, 1526, 1530, 1536, 1543, 1545, 1548, 1563.
Metals, including apparatus for their manufacture, 1521, 1558.
Chemistry and Photography—*none*.
Electrical Apparatus, 1515, 1516, 1540, 1541, 1549, 1550.
Warfare, 1518, 1544, 1546, 1553.
Letter-Press Printing—*none*.
Miscellaneous, 1500, 1507, 1511, 1517, 1525, 1533, 1542, 1547, 1551, 1552, 1557, 1562, 1567.

1499. E. Tailbonis. *Improvements in rectilinear knitting frames.* Dated May 17, 1862.

This consists in applying to rectilinear knitting frames a mechanical arrangement, by which the inventor obtains the required diminutions by the same power as that for working the loom without hand work. The supporting bars are placed under the needles at the taking-up place to form the meshes with regularity even with uneven or stiff threads. By the improved arrangement he has the shaft which carries the cams eccentrics, and inclined planes, longer than usual, so that, by a peculiar mechanical arrangement, the shaft is enabled to receive a lateral motion, which causes it to slide in the bearings; the different parts carried by the shaft then act on the spherical agents by which the diminution is effected on each side of the different pieces of knitted fabric, the weaver only having to take care that the threads do not break. *Patent abandoned.*

1500. J. Hogg, jun. *Improvements in book-covers.* Dated May 17, 1862.

The main feature of this invention consists in perforating the cloth used for the cover of the book, and fixing to the millboard of the book cover one or more layers of coloured or gilt paper, the coloured surface of the millboard appearing through the perforations in the cloth. *Patent completed.*

1501. J. Broadley. *Improvements in means or apparatus employed in weaving.* Dated May 17, 1862.

This relates—1, To a combination of means in connection with the jacquard apparatus for governing the times and order of motion of shifting shuttle-boxes of looms. 2, To the means of arranging and operating parts for producing gauze weaving, and changes from guaze to other weaving. *Patent completed.*

1502. J. C. Hill and D. Caddick. *Improvements in puddling furnaces.* Dated May 17, 1862.

Here the iron bottom or bed of the hearth, and the arched roof over it, are supported on iron columns; this is done in the following way:—The bed or bottom is supported on short columns, arranged around the outer edge of the bed; on the top of these columns a metal frame rests; this frame is open in the centre, and the outer edge of the frame is of the same shape as the outer edge of the bottom of the hearth. Across the opening in the centre of the frame bars or beams are placed, which support the metal plates forming the bottom or bed. The sides of the hearth are formed with broad flanges, upon which the arched roof is supported; these flanges also rest on iron columns, placed at intervals along the side of the hearth, these columns being made longer than the columns which support the bottom or bed. In order to be enabled to cool the bottom and sides, and ends of the hearth, arrangements are made for directing jets of water against them, and through the ends and under the bottoms of the furnace, and of the hearth, that is to say, at the bottom and bridge, and sides and ends, holes are formed, in order that the jets of water may come in contact with the lining which is placed over those parts of the hearth. *Patent abandoned.*

1503. J. Needham. *Improvements in sheathing or coating iron ships.* Dated May 17, 1862.

Here the inventor sheaths iron ships with copper, Muntz metal, &c., and causes it to adhere thereto by soldering it over its entire surface. He unites the metal sheathing to the iron by material, a non-conductor of electricity. For this purpose he uses gutta percha, or an analogous material, as a cement, which he interposes in sufficient thickness for the purpose. *Patent abandoned.*

1504. C. H. Tessier. *A new safety lock.* (A communication.) Dated May 17, 1862.

The fundamental principle of this invention consists in the application of two series of small blades, the one being situated within the lock, and the corresponding series on the key. In the one series, as in the other, each blade differs from the adjoining one, either in dimensions or in profile. Each individual blade is of extreme mobility, or else maintained by a spring, in some position differing from the normal one, until the two series are brought in juxtaposition by the application of the key to the lock, when, owing to their peculiar form, they assume the position which alone permits of the key turning round. Owing to the extreme mobility of the blades, any pressure that is exerted upon one or more blades of the same series, for the purpose of taking an impression in wax, will cause the blade or blades to recede to a certain extent, and no attempt at taking impressions, however often repeated, whether upon the blades of the lock or upon those of the key, will give a clue to the normal position, which is only produced by the two series meeting each other, and of which there is no trace left when they are disconnected. *Patent abandoned.*

1506. F. E. Sickels. *An improved apparatus for steering vessels.* Dated May 17, 1862.

This refers to a previous patent, dated 21st October, 1862 (No. 2410). The patentee claims governing the action of engines employed to operate the rudders of ships by a tension cord, or an equivalent connection, capable of indefinite extension, for the purposes set forth. *Patent completed.*

1507. J. C. Gore. *Improvements in belt shippers.* Dated May 17, 1862.

This consists of an oscillating double elbow or rivetted T piece, in combination with a single spring locking pawl. A two-notched slide carries the belt-guide, and is provided with a lever or its equivalent, whereby, when the slide has been locked by the pawl with the guide in either of its two portions for guarding the belt, the pressure applied to the lever, or its equivalent, to shift the slide for shipping or shifting the position of the belt from its fast to its loose pulley, or *vice versa*, will first cause the unlocking of the slide, and then give the latter the proper end-way movement. When the movement of the slide has been given, it will be again locked, and remain so locked until the pressure on the lever is reversed. *Patent completed.*

1508. J. Wright. *An improved method of sheathing iron or metal ships, in order to protect them from the action of salt water, fouling, and other such like influences.* Dated May 19, 1862.

Here the patentee proposes to introduce a sheathing of wood planks between the two metals, and the way in which he combines these forms the chief feature of this invention; that is to say—he proposes to isolate the metal skin of the ship from the copper, or other sheathing, by a layer of planks, or a layer of planks supplemented by a layer of india rubber, or felt, or other such gummy substance, and the gist of the invention consists in the particular mode by which he attaches and binds the said substances to the iron skin, and to one another. This he effects by passing screw bolts through the wood and water-tight sheathing into the similar lapped bolt hole on the iron skin, and after screwing it home, holding it tight up by a nut and washer inside. *Patent completed.*

1509. J. Eastwood. *Improvements in machinery or apparatus for removing or wringing hanks of thread or yarns, and all kinds of fabrics, when saturated with liquid.* Dated May 19, 1862.

This consists of a suitable frame of any required form and construction, adapted to the vessel with which the machine is intended to be used, and fitted with a lifting and wringing single or multiple snatch-hook, pressing rollers running, and lifting, and turning gearing. When required, the machinery of the apparatus may be made of a portable form, and mounted upon wheels or otherwise, so as to be capable of being used with different vessels. *Patent completed.*

1510. R. Ramsden. *Improvements in machinery or apparatus for mashing malt.* Dated May 19, 1862.

This consists of an arrangement of machinery and parts whereby a light washing spindle, driven at a high velocity, and having short prongs on it, shall travel about a mash tub so as to effectually wash or mix all portions of the goods and water submitted to the operation. *Patent abandoned.*

1511. G. Macdonald. *Ginning cotton, and for cleaning and preparing any fibrous substance, and also for cleaning or polishing any metal or other substance, designated "Macdonald's fibre buffs."* Dated May 19, 1862.

This consists in the manufacture of rollers or horizontal frames, or any desired shape, of compressed fibrous or other substances. The said fibre or hair is compressed by any mode of pressure screw, or otherwise, and while under the pressure and still in the press, is cut to the required shape, and secured in this shape by any strong adhesive substance, with or without heat; it is let into compartments made for its reception on the surface of the collar, and other shaped buffs, and secured in these compartments with such said adhesive substance and in like manner, each compressed section of the fibre or hair is let in side by side, so as to form a continuous compact surface. *Patent abandoned.*

1512. F. C. Kirkman and R. Swift. *A new and improved joint for uniting or fixing posts and rails of bedsteads, and other articles of furniture, posts and rails in fencing, in the construction of framework for conservatories, emigrants' and other portable houses.* Dated May 19, 1862.

The inventors attach to the corner pillar or post, where the side or end rails are fixed, a wrought or cast hollow metal block, in which are formed mortices or sockets proceeding from the sides of the block at right angles one with the other, as the case may be, and downward from the top of a precisely similar form to that of the tennon to be inserted. The side and end rails at their extremities are set or formed so that they will lap one over the other, and are also provided with a hole punched or drilled in the top portion of the rail to pass over a *I* shaped bolt or pin, which is securely fixed in the hollow metal block by the *I* or head, the bolt end standing upward for the purpose of receiving the side and end bars or rails, which are dropped vertically over the bolt and into the mortice, or notches in their position, as described. The upper portion of the post or cap is provided with a screwed nut fixed on its base, which, upon the sides and end rails being placed in their respective positions, is immediately screwed on to the bolt or pin, and tightly in contact with the side and rails and hollow metal block, forming a complete union of the various parts. *Patent abandoned.*

1513. W. Pickstone and T. Melloden. *An improved fabric in the nature of a cord or corduroy.* Dated May 19, 1862.

Here the inventor makes an improved fabric of this description, by using as the pile weft a silken yarn, produced from what is known as silk waste. *Patent abandoned.*

1514. J. Lee. *Improvements in the construction of traction engines.* Dated May 19, 1862.

This relates, 1, To the wheels of traction engines, and consists in adapting transverse bars of metal to the felloes of the wheels, to ensure greater hold of the said wheels in the ground than heretofore, so as to prevent the slipping round of said wheels, and further in connecting together at will two of such said wheels by plates, extending from the felloes of one wheel to the felloes of the other and opposite wheel, so as to enable the said wheels to be worked in a similar way to a roller. 2, It relates to the balancing of the boiler, which the inventor proposes to balance across the axle, and to elevate and lower the same as desired, by a lever, worked by hand, or by a screw from the fire-box end of the engine. 3, To the supporting of the intermediate wheel which connects the spur wheel with the pinion on the fly wheel shaft, he proposes to employ links for that purpose attached to the axle tree and fly wheel shaft. *Patent abandoned.*

1515. T. Morris, R. Weare, and E. H. C. Monckton. *Improvements in the means and apparatus for the protection of life and property by the agency of electricity.* Dated May 19, 1862.

The patentee claims the application of induction coils and constant batteries to the better protection of life and property, by detecting and securing the persons or the intending burglars or thieves, as specified. *Patent completed.*

1516. T. Morris, R. Weare, and E. H. C. Monckton. *Improvements in obtaining and applying light and heat by electricity.* Dated May 19, 1862.

This consists in obtaining light by passing electricity through vacuum tubes, or other suitable vessels, the electricity used being obtained from frictionall, electro-magnetic, magneto-electro, or hydro-electric machines, and also from other sources. *Patent completed.*

1517. A. V. Newton. *Improved machinery for splitting leather.* (A communication.) Dated May 19, 1862.

This consists in combining with a gauge roll used for regulating the thickness of the leather to be split, a feed roll susceptable of being depressed in a line parallel with the axis of the guage roll, either by the action of the operator or the inequalities of the leather as they pass between the feed and guage rolls, so as to prevent the choking or clogging of the machine, a thing of frequent occurrence in leather splitting machines. *Patent completed.*

1518. M. A. F. Mennons. *Improvements in certain descriptions of breech loading fire-arms.* (A communication.) Dated May 20, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1519. M. A. F. Mennons. *Improvements in the method of, and apparatus for, applying screw power to the locomotion of railway trains on steep inclines.* (A communication.) Dated May 20, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1520. M. A. F. Mennons. *Improved process for the conversion of amylaceous matters into saccharine and other useful products.* (A communication.) Dated May 20, 1862.

This relates to an improved mode of treating amylaceous matters in the manufacturing process of saccharification by acids, with a view to obtain, 1, more perfect extraction of

the saccharine constituents of the raw material than by the ordinary means. 2, Preservation of the nutritive principle of the residues of the manufacture, which are thus rendered advantageously applicable to the nourishment of live stock. *Patent abandoned.*

1521. W. NAYLOR. *Improvements in forging metals, and in power hammers employed therein.* Dated May 20, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1522. R. TALLERMAN and L. A. TALLERMAN. *International ladies' companions.* Dated May 20, 1862.

This consists in the use of a cover for the boot or shoe, made of leather, cloth, or other material. It is placed over the boot, and, when on it, reaches 8 or 9 in. up the leg; it is fastened at the sides by hooks, eyelets, springs, buttons, or other contrivance, under the waist by a strap or elastic band, and at the toes by small pieces of sole leather or other material. *Patent abandoned.*

1523. J. TAYLOR. *Improvements in abstracting heat from liquids and aeriform fluids, and for other purposes.* Dated May 20, 1862.

This consists of an apparatus used, of several parts, amongst others an air-pump or air-pumps, and in the use of mixed liquids of low boiling points in vacuo, or under pressure, acids and chemical compounds in combination with the combined apparatus above named for abstracting heat from liquids, the apparatus being worked by hand or steam power. *Patent completed.*

1524. W. CLARK. *Improvements in paddle and other hydraulic wheels.* (A communication.) Dated May 20, 1862.

This relates to improvements in paddle and other water-wheels, whereby the surface of the float boards or pallets are always kept perpendicular, that is, at right angles to the action of the water. To obtain this result the inventor uses either flat or undulating pallets, each furnished with axes turning in bearings in the sides of the wheels; they are further provided on one edge with a counter-balance weight, which constantly tends to keep their centre of gravity below the centre of oscillation, so as to always maintain the pallets in a vertical position. *Patent abandoned.*

1525. E. FEWKELL. *Improvements in the manufacture of metal tubes and in machinery to be employed for the purpose.* Dated May 20, 1862.

This consists in an improved arrangement and form of rollers, by which the patentee is enabled to make metal tubes of various descriptions taper, parallel-sided, or six-sided in section. He employs three rolls, suitably mounted in bolsters; the axles of these rolls are in the angles of a triangle, the rolls being of a convex form from end to end, in a line with the axles, so that the bite shall come upon the tube after it has entered between the rolls. The bolsters are open in the centre, so that the tube entering through one bolster passes through the rolls, which all revolve in one direction, and out through the opposite bolster. The rolls are geared in any suitable way, and are fitted with proper raising gear, so that they are capable of being adjusted. *Patent completed.*

1526. M. VOGL. *An improved apparatus for protecting houses and other buildings from burglars.* Dated May 20, 1862.

This apparatus is constructed somewhat in the form of a gun-lock, the mainspring and tumbler being enclosed in a metallic case, secured by rivets and by the pivot screw on which the hammer works. One end of the case is furnished with a projecting screw, or other convenient fastening, for fixing the apparatus into the jamb of a door, or the sash of a window, or shutter, or into any other part of a building necessary to be protected from burglars; the lower half of the trigger works one way on a hinge or joint, so as to enable a door or other moveable or closing part of a building to be brought, when closed or shut from the back, to the front of the trigger, the lower part of which then falls, or is brought back by a spring into a line with the upper part, and offers an impediment to the opening of the door or window, or to the motion of any other part of the building attempted to be acted on by the thief. The trigger, when actuated, releases the hammer, which falls upon a nipple on the top of the case, and discharges a percussion-cap, so as to cause an alarum to the inmates, the police, or neighbours. *Patent abandoned.*

1527. J. KENNEDY. *Improvements in ship propellers.* Dated May 20, 1862.

This invention consists in forming propellers by fitting to an axis two blades in the form of the tail of a fish, and in making the blades more or less deep and long, and in altering their pitch according to the speed at which the ship to which the propeller is to be fitted is to be driven. *Patent completed.*

1528. W. PETRIE. *Improvements in vessels for boiling chemical products, as sulphuric acid, and in apparatus for indicating the degree of concentration and temperature of such products in the boiler, which apparatus is applicable to other pyrometric purposes.* Dated May 20, 1862.

The patentee claims, 1, The means of outflow for the boiling liquor, namely, an open shaped vessel fixed within the boiler, and having its run at a level suitable to receive the foam as it rises from the liquor, so that the foam shall settle therein and pour out in a liquid state by a syphon, or through a tube attached to the vessel, so as to trap the vapour within the boiler while the liquid flows out through the tube, as described. 2, The general construction of the vessel for boiling chemical products, arising from the peculiar combination of parts, themselves formed and combined, as describad. 3, Deadening, frosting, or roughing the heated surface of such vessels externally, as described. 4, The particular construction of the pyrometric apparatus, all as described and represented in the drawings. *Patent completed.*

1529. H. B. BARLOW. *Improvements in presses for cotton and other substances.* (A communication.) Dated May 21, 1862.

Here the followers of the presser are connented to elbow levers or knee-joints, which are actuated by right and left handed screws cut in a shaft to which a wheel is keyed; a worm or pinions gears into this wheel, which, in revolving, causes the followers to approach each other, to compress the cotton or other substances. As soon as the bale is corded or lashed, the wheel is turned round in the contrary direction to separate the followers, thereby liberating the bale, which is then removed, and a fresh supply of cotton or other substance to be compressed, is placed in the box or trunk in which the followers work. *Patent completed.*

1530. J. HOPKINSON. *Improvements in pianofortes, and in the hammer-rails of pianofortes.* Dated May 21, 1862.

This consists in a method of applying stoppers of vulcanized india-rubber, cork, or other elastic substance, aided by springs, or other contrivances, and made to press upon certain parts or equal divisions of the strings of pianofortes, so as to divide the vibration, and to produce sounds called harmonics, which differ from the original notes or sounds of the strings. Also in a new hammer-rail, for vertical or upright pianofortes, by which the butt lunges, are brought nearer to the strings, and a quicker and more certain return of the hammers, after having struck the strings, is obtained, and which remedies a defect in the mechanism of these pianos, and compensates for the difference between them and the grand or horizontal pianofortes. *Patent abandoned.*

1531. J. KENNEDY. *Improvements in plates for plating and for forming the outside skin of ships and vessels, and in protecting the same from fouling and oxidation.* Dated May 21, 1862.

This invention consists in forming iron or steel plates, to be employed for the outside skin or surface of ships and vessels, with a rib or ribs rising from that which is to constitute the outside surface of the plate, in forming a rabbet or V groove in the sides of the ribs, in inserting strips of iron or steel into the grooves between every two ribs, space being left between the surface of the plates and the said strips, and in filling up the spaces between the ribs and above the level thereof with white lead. The inventor finishes off the white lead face-smooth, allows it to set and harden, and then paints it, or not, or applies an oily or greasy material or composition thereon, or not, as desired. The object of the metal strips is to assist in holding on the white lead. Care must be taken to ensure the metal being clean and free from oxidation before applying the white lead. *Patent abandoned.*

1533. M. A. LE BRUN VIRLOY. *Improvements in drying and carbonizing wood, peat, and other fuel.* Dated May 21, 1862.

The apparatuses for carrying this invention into effect may be of any convenient form or dimensions, and may be placed either horizontally, vertically, or inclined, and consist of chambers or furnaces made in masonry, iron, or other metal, or even clay or sand, supported and held together by metal plates. In the apparatuses the temperature is maintained higher at one end than at the other; the operation is continuous, and the materials are caused to advance successively from that point where the temperature is lowest to where it is highest. The main features of the invention consist, 1, Introducing wood, peat, and other material at one side or end of a furnace, and withdrawing it from the other side or end in a state suitable for its being employed as fuel. 2, In hermetically closing the doors or other openings to the furnace during the operations, whereby liability to taking fire is avoided. 3, In regulating by means of taps, valves, and registers, the size of the holes in the covers, and in the apparatuses themselves, according to circumstances, to increase or diminish, for example, the activity of the fuel, and the operation, or for regulating the admission and exit of air, gas, and other volatile products. 4, In collecting and removing therefrom a portion of the volatile products after the whole or part of their caloric has been utilized. 5, In utilizing, as far as may be, the same materials and debris of slight value, as well as the combustible gases produced by the operation itself; in short, making use of the waste heat which, in the ordinary processes of drying and carbonizing, is carried away by the vapours and gas escaping at a high temperature. 6, Submitting the wood, peat, or other material to heated first to a low temperature, and gradually increasing it to a high temperature. The operation may, if desired, be facilitated by fans, currents of air, gas, or otherwise. *Patent completed.*

1534. W. BUSH. *Improvements in the construction of ships, and in shields or armour for ships and batteries.* Dated May 21, 1862.

This invention consists in constructing ships intended chiefly as ships of war and floating batteries, as hereafter explained. The patentee forms the ribs and girders of angle irons bolted together, and with timber between every two irons, each rib being composed of two angle irons with timber between them; instead of angle iron bar iron may be used. The outside or hull of the ship may be of timber or of iron, or partly of timber and partly of iron, rivetted or otherwise secured to the ribs. Between the outside or hull and the skin or inner lining of the ship, which he prefers to be of iron, there is a space into which and between the ribs he inserts movable iron or steel armour blocks or plates, which may be made to slide up and down in the said space, to enable the blocks to be inserted and removed as required. Under the port holes on each side of the ship, the blocks are connected to an oscillating platform which carries the gun and carriage. By the employment of an oscillating platform, one half of the usual compliment of guns and men may be dispensed with. The gun after discharge recoils, causes the platform to tilt, and thus brings up the block to close and shield the port hole. He fits a turn-table to the gun carriage to run on, so that if required the gun may be turned and run out to be fired on the opposite side of the ship; or it may be again run out on the same side, its forward motion causing the shield to lower and open the port hole. A space between the armour block and the outside of the ship may be filled with felt, kamptulicon, or other suitable material. The cupola is pierced with holes for rifles. The invention also consists in constructing armour or shields for ships and batteries, however the ships or batteries may be otherwise built, by connecting armour plates and blocks to an oscillating platform, which may be made to work armour or shields at both ends, so that, while the port holes on one side are shielded, the shields are removed from the port holes on the opposite side. The invention further consists in constructing ships with hollow metal keels or keelsons, and with water-tight compartments, for the purpose of containing fresh water and other provisions, as well as affording stability to the ship and for "heeling" her over. *Patent completed.*

1535. A. GILES. *Improvements in constructing floating breakwaters.* Dated May 21, 1862.

Here a series of buoys are used, which are connected together by metal chains, so that the area over which a breakwater extends is divided horizontally into numerous sections, by preference of a lozenge shape, there being a buoy at each angle of a section, and, in some cases, the chain which connects two buoys is further supported by an intermediate buoy. From the chains which connect the several buoys and divide the whole area into sections, there are suspended fringes or net work of chains, in order to break the waves by causing the same to pass through the meshes or openings of the suspended fringes or net work. The outermost and innermost rows of buoys are secured in their places by anchors. By these means the area occupied by a breakwater is divided horizontally by net work composed of chains, the angles of which network are supported by buoys, and from this horizontal net work other net work or fringes are suspended vertically. *Patent completed.*

1536. L. LEINS. *Improvements in travelling bags and apparatus used therewith.* Dated May 21, 1862.

We cannot here give space to the details of this invention. *Patent abandoned.*

1537. H. C. MEYER. *Improvements in the means of stopping or retarding railway and other carriages.* Dated May 21, 1862.

Here the inventor uses the weight of the carriages, or their motive power, as the brake power, to which end he shifts or turns the axles or bearings, and uses eccentric axles or bearings, or raises or lowers the bearings by any other motion, or reverses the eccentric axles or eccentric bearings generally, thus forcing the wheels towards a brake fixed on the body of the carriage. *Patent abandoned.*

1538. W. E. NEWTON. *Improvements in the manufacture of metallic or mineralized fabrics or surfaces.* (A communication.) Dated May 21, 1862.

This consists in coating the surface of a textile, woven, or other fabric with a thin sheet of metal, whereby the substance will be rendered waterproof, and may be applied for a variety of useful purposes in the arts. *Patent abandoned.*

1539. J. OXLEY. *Improvements in making wheels.* Dated May 22, 1862.

This invention relates to improvements in the preparation, by mechanical means, of the parts of wheels, by which is ensured perfect accuracy of fitting, when such parts are assembled; as also for the more perfect maintenance of the parts of wheels in their proper form, when completed, by the prevention of injury to the spoke, tenons, and other joints. Also to the machinery for the production and multiplication of certain parts of wheels, and for their reproduction according to pre-arranged scales of proportions and dimensions. The improvements in the treatment of the felloe pieces of wheels consist in the accurate thicknessing to a guage of each piece, by operating on the two sides at the same time, and this is effected by passing the piece of material to be operated upon between two revolving discs having cutters mounted therein. The machine for thicknessing or planing felloes consists of a bed or gantry, having two moveable head-stocks thereon, and a transverse table, upon which is mounted the carriage and means of holding the piece of material to be operated upon. Each head-stock carries a revolving spindle or shaft, with an overhanging disc, containing one or more adjustable face-cutters or chisels, between which the material is made to pass, and by which it is to cut. The distance between the cutters is capable of adjustment by reason of the movement of the head-stocks, according to the thickness to which the material has to be gauged. Each part of the machine is capable of accurate adjustment and regulation. For the purpose of ensuring accuracy in the after processes of preparing the felloes and other pieces of the wheel, each felloe piece having been examined by the workman, has two gauge points or centre marks impressed upon one face, so that between those gauge points certain gauge holes are bored or drilled in a machine designed for that purpose; a central hole is drilled, of a depth of, say, 1½ to 2 in., and on each side of such hole another gauge hole of lesser depth (say ½ in. to ¾ in. deep) is made. By these holes the materials are accurately applied and adjusted in the various machines in which the subsequent operations are performed, by which means accuracy of reproduction is secured. For the purpose of boring and morticing with greater accuracy and rapidity the naves of wheels for receiving the tenons of the spokes at any required angle with the central axis of the nave, and ensuring that any number of naves for a given size of wheel may at any future time be produced as identical counterparts of naves previously made, the two operations of boring and morticing are performed without the necessity for removing the nave from the axis, shaft, or spindle by which it is caused during the operation, and without removing it from the composed machine. The carriage upon which the nave is mounted for the purpose of being operated upon is capable of being adjusted in relation to the vertical sliding or revolving tool, and the exact angle desired may be obtained and recorded on a scale by means of a pointer arm. For the purpose of forming a more perfect wheel, the patentee cuts an annular groove or recess within the nave for the purpose of inserting a ring or collar of leather, or other material, upon which the inner ends of the spokes will take their bearing, and thus forms an elastic bed or cushion between the end of the spokes and the iron axle-box, and by which means a nearly noiseless wheel will be produced. *Patent com-pleted.*

1540. C. W. SIEMENS. *Improvements in electric tele-*

graph apparatus. (Partly a communication.) Dated May 22, 1862.

This invention consists in communicating codes of signals by particular mechanical agency, by which great rapidity and accuracy of transmission is obtained. In the specification to former letters patent granted to the present patentee, and bearing date the 25th of February, 1859 (No. 512), he described an arrangement where types were employed, having elevations or depressions representing the letters or signs to be transmitted, which typers were arranged in a row, or in rows, and acted consecutively upon a contact lever in connection with a galvanic battery, or other source of constant currents of electricity, so as to cause it to make and break contact with the recording instrument, thereby producing signs exactly corresponding with the form of the types. In the present invention the arbitrary succession of signals, constituting a letter, number, or sign, is represented by a type or by types, which is or are so formed that, on being passed along against a contact lever, a series of currents is passed through the line wire, which currents are produced by a magneto-electric machine or other apparatus that produces a regular succession of currents, the same being moved in such a manner by the same mechanism, which imparts motion to the types, that, at the moment when the type completes the line wire circuit, a positive or negative current, such as may be required, is produced and transmitted through the line wire. *Patent abandoned.*

1541. J. H. Perry. *Curing diseases of the human body by magnetism.* Dated May 22, 1862.

This invention consists of an apparatus which the patentee denominates the magnetic equilibust, or regulator of the human health. The apparatus is formed of suitable design and dimensions, with moveable and adjusting parts, capable of receiving and supporting the human body in a sitting or reclining position, and the part which receives and supports the head is fitted with a magnetic cap or other vestment, in which polarized magnets are arranged, as hereinafter described. The arm rests are fitted with one or two galvanic batteries, and the part which supports the back of the patient a belt, in which a number of polarized magnets are also arranged, is fitted. This belt is intended to pass round the body or loins, and is provided at the ends with suitable fastenings for securing it in the required position. At the seat of the frame a cushion, in which a galvanic battery is fitted, is also placed, and upon the part which supports the feet another galvanic battery is mounted. The batteries for the feet and seat are square, and those for the hand are semi-cylindrical, and are formed with, or adapted to, square, cylindrical, or semi-cylindrical metallic chambers, furnished with heaters, to be used as circumstances may require. The square battery for the feet is fixed to a semi-cylindrical metallic chamber, and mounted upon an axle, so as to be capable of being moved by the foot. The parts of the semi-cylindrical batteries upon which the hands rest are also mounted upon pivots, or universal joints, so as afford free movement to the hands. The seat battery is also mounted upon an axle or dead pin to allow the necessary movement thereof. By means of the magnetic vestments and galvanic batteries a permanent, though insensible magnetic current, is established throughout the body, from the head to the feet, without having recourse to any additional conductor than the polarized magnets, the galvanic batteries, and the vital principal of animal life. Small batteries to be used without heat are also placed in the soles of the shoes or boots. *Patent completed.*

1542. E. De La Bastida. *A new process for the production of designs in relievo, and in deepening on sheets of india-rubber of any length whatever.* (A communication.) Dated May 22, 1862.

This invention consists in the production of cheap ornamental designs. The patentee takes a number of small separate pieces of metal, or other suitable material, having upon them deiigns sunk or in relief of an ornamental character, and with them, upon an iron table, composes numerous parts of types, and thus produces the patterns for carpet or other article to be made. He then places a sheet of india-rubber, or india-rubber compound, prepared for vulcanization, and of suitable thickness, upon the pattern composed of ornamental designs, and brings down a plate of metal with sufficient force to press the sheet of india-rubber into or upon the design, and he takes an exact impression thereof. He then heats the table and vulcanizes the india-rubber, after which it is unchanged by moisture or atmospheric influences. *Patent completed.*

1543. G. Crawford. *Improvements in musical instruments.* Dated May 22, 1862.

This invention relates to a peculiar construction of musical instruments capable of being played upon by means of keys similar to a pianoforte, and consists in substituting for the strings hitherto used in pianofortes, a number of metal prongs or "vibrators," somewhat similar to those used in musical boxes, or similar to the musical pitch forks properly tuned and acted upon, either by "jacks," as in the harpsichord, or by hammers brought into play by a percussion action on the keys. Another part of this invention relates to an improved action, which is applicable to pianofortes, as well as to the improved instrument, whereby greater nicety of touch, with increased power of blow and effective check action, at a reduced expense, is obtained. These improvements consist in making the butts of the hammers bevelled or curved inwardly on their under surfaces, and in causing the fly to act directly upon such butt, thereby dispensing with the use of stickers and levers. The bevel or curve forms also an efficient check to the fly, preventing it from being thrown too far forward. One portion of these bevels may be made adjustable, so as to regulate the check action. It is proposed to apply springs under the butts for the purpose of assisting in throwing the hammer from off the prong or string after striking, and so affording a more effectual repeat action, and giving greater elasticity of touch. *Patent completed.*

1544. J. Needham. *Improvements in breech loading fire-arms, and cartridges for such fire-arms.* Dated May 22, 1862.

These improvements in breech loading guns consist in mounting and fitting the barrel of the gun in such manner that, by the motion of a lever, it is first moved longitudinally away from the breech piece, and then swivels or moves on a centre out of the line of the gun and so exposes the breech end of the barrel or barrels. The patentee further makes the breech piece with a parallel recess for each barrel to receive the rear end of the cartridge, say, to the extent of ⅜ths of an inch. The object of the barrel first moving forwards is to withdraw this length of the exploded cartridge out of the recess before mentioned, so that when the barrel is swivelled or moved out of the line of the gun, the projecting end of the cartridge case which was in the breech recess will present a good hold whereby to withdraw it from the barrel. Another cartridge may be then inserted in the barrel, which is replaced in position for firing by the reverse motion of the lever before mentioned. The second part of the invention relates to improvements in a breech-loading gun of the invention for which a patent was granted to the present patentee (No. 184), dated October 2, 1852, and consists of a hooked picker or instrument placed below the hinged breech piece; it lies along underneath this, and is jointed to the stationary screwed part. When the rotary screwed part that closes the breech is screwed back, the hooked end of the picker projects slightly beyond the nose of the breech-piece, and which in raising the breech piece out of the line of the barrel, takes hold of the end of the cartridge case, and pulls it out of the barrel. The third part of the invention relates to shot cartridges, and consists in making them of thick and stiff substances to the extent occupied by the powder, and the wad separating it from the shot, but beyond that point of a slight substance, and closing the end thereof by gathering it together like the mouth of a tied sack; but instead of tying it round, he drops a slight metal ring on it, and turns the edge back on the ring, which readily and effectually encloses the shot, and forms less obstruction thereto in shooting than the ordinary method of securing. Another part of the invention relates to guns in which the breech piece receiving the charge is pivotted near the rear or butt end, and is moved backwards and forwards in order to move in and out of the line of the barrel for loading and firing. According to these improvements, he fixes the female screw to the breech end barrel, which receives a screwed metal socket, within which the back end of the breech chamber is pivotted. The charge chamber of this breech piece terminates of a conical form, and is reduced to a small hole at the rear end, where it emerges, and by which the needle enters to explode the charge; or this aperture may serve for the entrance of the fire of the cap, the nipple for which may be placed centrally at the extreme end of the breech piece. *Patent completed.*

1545. S. and F. Turnbull. *Improvements in the manufacture of floor cloths.* Dated May 22, 1862.

The patentees claim, 1, The application of a surface of paper to the canvas, or foundation of woven fabric, of floorcloth, or other like coverings, as and for the purposes described. 2, The manufacture of floor and other coverings of painted paper, in the manner described. *Patent completed.*

1546. J. Kennedy. *Improvements in protecting the sides and decks of ships from the effects of projectiles.* Dated May 22, 1862.

This invention consists in protecting the sides of ships by means of wire ropes, in coils or otherwise, supported by metal springs. Instead of, or in addition to, the wire ropes, plates may be used. For the decks the inventor uses metal plates, backed or supported on metal springs. The object of the invention is to afford at the same time a resisting and yielding armour. *Patent abandoned.*

1547.

The nature of this invention consists in the application of rollers, composed wholly or in part of India-rubber, or other material of which india-rubber is a principal component, to the purpose of wringing clothes, or pressing water from fabrics, and also in a novel and simple construction and arrangement of the different parts of a wringing machine to accomplish the desired object in a convenient and perfect manner. While the form of construction renders wooden rollers practicable, those made of india-rubber, or other similar material, present several and decided advantages. The frame, which is entirely of metal, is constituted in part of levers, which perform all the offices of screws and springs, without possessing any of their objectionable features. By simply placing this "wringer" upon the side of the vessel in which, or on the side of the machine by means of which, the washing is done, without any adjustment or fastening, it is ready for operation, and remains firmly in its position. It may also be removed with the greatest facility. *Patent completed.*

1548. P. R. Hodge. *Improved dinner, supper, breakfast, or dessert plate.* Dated May 22, 1862.

This invention consists in the peculiar conformation of the plate, the rim or edge of which is so formed as to have either an annular continuous recess, or groove, around the body of the plate, or one or more recesses sunk or moulded into the rim, for the purpose of placing the various condiments, conserves, &c., in the said groove or recess, keeping them separate from the food on the plate, so that they may be used at discretion. *Patent abandoned.*

1549. G. Barlow. *Laying submarine telegraph cables.* (A communication.) Dated May 22, 1862.

This invention consists in laying submarine telegraphic cables by partially supporting them below the surface of the water during the paying out of the same by means of friction clutches, or appliances, supported from the ship's sides. *Patent abandoned.*

1550. H. Cook. *Improvements in electric batteries.* (A communication.) Dated May 22, 1862.

This invention has for its object the construction of a battery which shall work during several months without it being necessary to interfere with it, or renew any of the chemical agents which are employed to develope currents of electricity. The invention relates to a modification of that description of battery known as the Daniell's battery, and consists in the employment of sand, or any other pulverulent substances unattackable by acids, in place of the porous vessel ordinarily used. In combination with this sand, or other substance, sulphate of copper, in the state of powder, is employed in sufficient quantity to last several months. *Patent completed.*

1551. W. Roberts and T. Greenacre. *Improvements in cocks or valves for steam or other fluids.* Dated May 22, 1862.

In constructing cocks or valves according to this invention, the stem or spindle of the valve is caused to pass through a stuffing box at the top of the barrel or body within which the valve works. The stuffing box is divided from the barrel or body by a petition through which the stem or spindle of the valve passes, and there is a collar on the stem or spindle which is enclosed between the upper side of the partition and the bottom of the stuffing box, which is screwed down into its place over the collar, the interior of the stuffing box having a screw thread cut in it to admit of this being done. The upper or outer end of the stem or spindle of the valve has a handle fixed upon it, by means of which it may be turned round, and the inner or lower end of the stem or spindle has a screw thread formed upon it, which fits into a female screw formed in the upper end of the piece forming the valve; and the valve, which it is preferred should be conical at the bearing surface, and have a conical seat, can be raised off its seat by turning the stem or spindle, and causing the screw thereon to descend through the female screw. The valve, when it is raised, is received into the upper part of the barrel or body, where there are projections or ribs which guide the piece forming the valve, and prevent it turning whilst it is being raised or lowered. The seat of the valve is made separate from the barrel or body, and is screwed into its place at the lower end thereof from the outside. The outlet for the fluid to pass away from the cock or valve is on one side of the barrel or body. *Patent completed.*

1552. J. W. Evans. *Improvements in obtaining motive power by machinery.* Dated May 22, 1862.

To a horizontal bar the inventor connects at each end a rod, each of which rods is connected to a crank on a toothed spindle, upon the axis of which fly wheels are fixed. The toothed spindles drive toothed wheels, upon the axis of which spindles carrying tappets are fixed. Then from the horizontal bar he suspends a pendulum or heavy weight, and at each end of the course of the pendulum he places a hammer or spring. The action is as follows:—He causes the horizontal bar to rock and set the pendulum in motion; through the connecting rods the crank spindles and fly wheels are made to revolve, and through the toothed wheels the tappet wheels are also made to rotate, and the motions are so calculated, that upon the pendulum reaching the end of its course, first in one direction and then in the other, the tappets release the hammers or springs, which, falling or pressing on the pendulum, keep up its action. The motive power is taken from the fly wheel shafts or from the rocking bar, or from both. *Patent completed.*

1553. G. F. Goranson. *Improvements in the construction and arrangement of armour plates.* Dated May 22, 1862.

According to this invention, it is proposed to employ a number of ribs or rails having enlarged or expanded heads, of a round or other transverse section, which are secured by bolts to the surface to be protected. Over these ribs are laid transversely one or a series of plates bent so as to conform exactly with, and fit accurately, the corrugated surface produced by the ribs; by this system the head of each rib or rail serves to hold the plates firmly in their places, and, when a series of plates are thus bent and laid one over the over, the inner plate or plates will always hold the outer ones securely. The surface of the plates so disposed presents a series of corrugations or ribs, and in the hollow between these corrugations may be driven round or other shaped bars, so as to fill or partially fill the intervening channels or grooves. *Patent abandoned.*

1554. P. McGregor. *Improvements in spinning and doubling cotton, &c.* Dated May 23, 1862.

This invention consists in a combination and arrangement of machinery for regulating the amount of twist in the yarn. In performing the invention, the patentee applies a worm or tin drum shaft or other shaft in the carriage for driving the spindles; this worm gears into a wheel, to the shaft of which is fixed a wiper or tappet, acting when the carriage is out upon a lever jointed to the headstock; this lever, by means of a connecting rod shaft, or other equivalent agent, liberates a catch when the twist is completed, and allows the driving strap to be moved in the usual manner, either by a spring or weight, or by the action of a cane shaft. *Patent completed.*

1555. R. Blacklidge. *Improvements in the preparation of materials for sizing, dressing, or finishing warps, yarns, textile fabrics, &c.* Dated May 23, 1862.

This invention consists in treating flour of wheat or other cereal grain, rice, sago, or any other amylaceous substance or substances, with diastase, for the purpose of procuring a gummy matter, with which the inventor incorporates lapis calminaris, terra alba, and alumina, to any required extent, for the purpose of obtaining a compound suitable for sizing or dressing warps, yarns, textile fabrics, or paper, and also for thickening colours. *Patent abandoned.*

1556. C. De Bergue. *Improvements in the manufacture of metal reeds for weaving.* Dated May 23, 1862.

This invention has reference to regulating the speed (at the starting and stopping) of the winding drums, or reels, to the treatment of the wire while passing from one reel to another, including improvements in the tools or apparatus for filing, planing, gouging, polishing, or otherwise treating the wire, and to the construction and working of the bobbins and fliers for carrying the bands or binders to be used in the setting machine, and of the driver, or "beater up," to be used in the said machine, and comprises much detail, which we cannot produce here. *Patent abandoned.*

1557. W. E. Wiley. *Improvements in penholders.* Dated May 23, 1862.

This invention relates to those kinds of penholders called "Orthodactylic penholders," that is, penholders having a series of finger and thumb plates disposed on their surfaces, by which plates the correct position of the fingers and thumb on the said holders is obtained. Each of the said finger and thumb plates is ordinarily made of a separate piece of metal, and is fixed to the penholder by soldering, or by means of a sliding ring. This invention consists, 1, In making a set or series of the said finger or thumb plates of one piece of sheet metal, by which method of manufacture great economy in their production is effected. 2, In fastening the finger and thumb plates of Orthodactylic penholders, when each of the said plates is made of a separate piece of metal, to the penholder, by means of small tongues, or projecting pieces, on the said plates engaging in piercings in the penholder, the said tongues, or projecting pieces, being fixed with or without the addition of solder. *Patent completed.*

1558. J. Webster. *Improvements in coating and indurating metals.* Dated May 23, 1862.

The object of this invention is to coat iron or steel articles, or surfaces of copper, and other metal surfaces, with an alloy, which will harden the surface to which it is applied. In carrying out this invention, the patentee takes the article, if of wrought iron or steel, and thin or light in substance, and brings it to a red heat in a furnace, and he coats the article with an alloy composed of the following metals, mixed in or about the following proportions, viz., three parts of pure tin and one part of antimony. In making this alloy, he first melts the antimony, and then adds the tin thereto while the antimony is in a molten state, and of this alloy, either in a cold or melted state, he takes one part, and mixes therewith two-and-a-half parts of copper. In doing this, he first melts the copper, and then adds the alloy of tin and antimony; or, the copper having been melted, he adds the antimony alone, and stirs it well into the copper. He then adds the tin, and amalgamates the whole. This mixture is to be kept at a low red heat if used for sheets and other thin forms. The surface of the mixed metals, or melted alloy, is covered with a flux, consisting of one part of the the yellow prussicate of potass and two parts of either caustic or carbonate of potass. The molten alloy should be covered to a depth of 2 in., and the bath will then be ready for use. The sheet or article of wrought iron or steel to be operated upon is then to be heated to a red heat, and in this state it is to be passed through the flux into the bath of the molten alloy, by which operation the article will be completely coated, and its surface indurated or hardened. For articles made of cast iron and copper, this mixture of metals, or alloy, will also answer, and may be applied in the same manner. *Patent completed.*

1559. J. Ward and J. Dewick. *Improvements in the manufacture of textile or looped fabrics.* Dated May 23, 1862.

This invention relates to certain new arrangements and combinations of parts, supported by an ordinary framework consisting of end standards, and, where the length of the frame makes it requisite, by intermediate standards also, the said standards being connected together by a top tie bar and one tie bar. In this improved machinery or apparatus there is, according to one modification of the invention, a needle bar, to which a to and fro movement is imparted as follows, that is to say:—There are two or more short links upon one end, to which the needle bar is secured; the other ends of the links are hinged to brackets attached to a spindle bar lying below and at the back of the needle bar. There is also a horizontal bar attached to the needle bar at each end of the machine; the front end of the horizontal bar works on a pin or axle secured fast at the position required in the slot of a link moving on an axle secured to the front framing of the machine. There are two cam shafts, one at the back and the other at the front of the machine. The needle bar is moved by cams on the back shaft, and by intermediate links and levers. Each of the aforesaid cam shafts is provided at one end with a bevil wheel, which wheels gear into similar wheels on each end of a short horizontal shaft at one end of the frame; the bevel wheels on this shaft are twice the size of the bevel wheels on the cam shaft. The cam shafts will make two revolutions while one revolution is being made by the short shaft. This short shaft is also provided with suitably arranged wheels. *Patent completed.*

1560. E. Molino. *Improvements in apparatus used in weaving.* Dated May 23, 1862.

The patentee claims, 1, The employment of an ordinary magnet for moving the shuttle to and fro, instead of an electric magnet. 2, The method of arranging the magnet with or without its mounting of iron bars. 3, The peculiar mode of constructing the shuttle. The invention cannot be fully described without reference to the drawings. *Patent completed.*

1561. E. Maw. *Improvements in constructing ships, vessels, forts, and batteries.* Dated May 23, 1862.

This invention consists in certain improvements in constructing ships, vessels, forts, and batteries. For these purposes the inventor constructs hollow armour plates and backing, by combining corrugated sheet metal with other forms or descriptions of iron, steel, or homogeneous metal, the corrugations of one or more of these corrugated plates abutting against each other, or against a middle uncorrugated plate or plates. By means of a middle plate he facilitates the jointing and overlap of the corrugated plates, and reduces the strain upon the fastenings. In order to produce a uniform bearing and resistance when using middle plates, he forms in such plates, at such intervals as may be desired, corrugations corresponding with the corrugations of the other plates, the other parts of the middle plates being left plain or flat, by which means what may be termed curved tongues are produced, which contribute with the other parts of these plates materially to retain all parts in a sound condition. In order to prevent the splitting of the solid iron armour plates, similar to those now in use, ferrules or casings in one or more parts are used, shrunk into an inner tube made in whole or in part, of iron, steel, or homogeneous metal, and he further covers the bolts or rivets—to be made either hollow or solid for fastening the armour plates or backing together, or to the vessel or backing—with casings of steel, iron, or homogeneous metal, for the purpose of strengthening them, and preventing them splitting. *Patent abandoned.*

1562. A. Samuelson. *Improvements in hydrostatic presses.* Dated May 23, 1862.

This invention relates to a peculiar construction and arrangement of accumulating apparatus to be used in combination with hydrostatic presses for crushing seeds, nuts, or other fatty substances, and consists essentially in the adaptation to such presses of an accumulator, so arranged that one weight produces two distinct pressures, one considerably greater (by preference nine times greater) than the other. This is effected in the following manner:—There is a lower cylinder containing oil, water, or other liquid; in this cylinder a ram is fitted in the usual manner, and above this ram, and forming a continuation of it, is an upper ram about ⅓ the diameter of the lower one. This smaller ram is inserted into an inverted cylinder, also containing oil, water, or other liquid, and which cylinder is imbedded in and forms part of the weight or load. There is no communication between the two cylinders, each being charged by its own pump or pumps through proper pipes; these pipes also communicating with the stop-boxes attached to the presses. A stop-box may be fitted to each press, or one stop-box may communicate with and actuate several presses. Each stop-box is fitted with three ordinary cone valves, namely, one communicating with the low-pressure cylinder of the accumulator, one with the high-pressure, and the third to discharge the presses. The spindles of these valves have rather coarse pitched threads upon them, working through the packing glands as nuts, and above these threads, on the tops of the spindles, are cams actuated so as to open and shut the valves by a central cam and handle, and so arranged that, by one revolution of this central cam, all the valves are successively open and shut as required in the operation of oil pressing. *Patent completed.*

1563. W. Clark. *Improvements in socks and stockings.* (A communication.) Dated May 23, 1862.

This invention consists in making the above articles of supple leather, and to this end the inventor prepares, cuts out, and sews the said leather or skin either by hand or mechanical process, in the required forms or shapes, goffering the skins, if desired, for the purpose of cambering certain parts thereof. *Patent abandoned.*

1564. G. T. Livesey. *Improvements in purifying illuminating gas, &c.* Dated May 26, 1862.

One part of this invention consists in purifying illuminating gas produced by the distillation of coal from the impurities, such as ammonia and sulphuretted hydrogen contained therein, by means of sulphric acid. Another part of the invention consists in converting the products resulting from the before-described method of purifying the gas, as also the ammonical liquor resulting from its previous purification, by condensation into useful or marketable substances. *Patent abandoned.*

1565. J. Harrison and R. Parkinson. *Improvements in rollers for preparing spinning, doubling, sizeing, winding, warping, and weaving.* Dated May 26, 1862.

This invention consists in making the rollers or drums of the various machines employed in preparing, spinning, doubling, sizeing, winding, warping, and weaving, of sheet iron coated with lead, or a combination of lead with other metals or materials, which sheet iron is known to the trade as the "patent coated sheet iron," instead of making such rollers of turned sheet iron or brass, or other metal, or of wood, as now customary, thereby reducing the cost both of material and labour. *Patent completed.*

1566. W. and J. Harrison, J. Oddie, and W. Parkinson. *Improvements in machinery for winding, sizeing, and weaving.* Dated May 26, 1862.

These improvements in winding machines consist of an improved mode of constructing the rails for the bearings of the spindlee. The improvements in machinery for sizeing consist in supporting the end of the cone shaft in a swivel bearing, acted upon by a lever for throwing a pinion on the cone shaft, in or out of gear, with the wheel to be driven. The improvements in machinery for weaving consist, 1, In applying a regulating screw to the bearing of the tappet shaft, for regulating the depth of gear of the wheels. 2, In connecting the picking tappet to the tappet shaft, by means of a bush fixed to the shaft, on which bush, and on the picking tappet, teeth are cast; by this means the picking tappet is securely held, and its position can be easily regulated. 3, In applying a catch to the incline which passes through a slot in the breast beam, and serves as a stop to the lever supporting the weft fork, for applying the break to the fly-wheel when the weft motion acts. *Patent completed.*

1567. C. D. Bergue. *Improvements in iron framing.* Dated May 26, 1862.

This invention embraces the constructing iron frame work of two series of ribs or beams, one series of them shaped and applied to give the desired sections or form in one direction, and others shaped and applied cross ways to the first series to give the required sections or form in a cross direction; and the two series being rivetted or connected together and further strengthened by struts, or lies, or bars, applied in a direction at right angles, or nearly so, to both series of beams, and rivetted or connected to both, and fitted where necessary with filling up or bedding pieces for affording additional support to the intended coverings or surfaces. *Patent abandoned.*

1568. C. Brakell, W. Hoehl, and W. Gunther. *Improvements in steam and other motive engines.* Dated May 26, 1862.

This invention relates, 1, To valve gear for reciprocating engines, and to a mode or arrangement and combination of mechanism for actuating valves for admitting and cutting off the supply of steam, so as to work it at various degrees of expansion. 2, To improvements upon rotary steam-engines or wheels acting by the momentum of the motive power employed. In this class of engines, in order to obtain the greatest efficiency and economy, the turbine wheel should have a velocity bearing a certain proportion to the velocity of the entering steam or other motive power. *Patent abandoned.*

PROVISIONAL PROTECTIONS.

Dated July 28, 1862.

2134. W. Maugham, Prospect-place, Wandsworth-road. Improvements in the manufacture of effervescent beverages.

Dated Oct. 8, 1862.

2720. M. A. F. Mennons, 24, Rue du Mont Thabor, Paris. Improvements in self-inking hand stamps. (A communication.)

Dated Nov. 13, 1862.

3053. A. Twaddell, Glasgow, manufacturer. Improved arrangements for dressing or sizeing warps.

3057. J. Slack, Manchester, water filter manufacturer. Improvements in nursery swings and cots.

3059. W. E. Gedge, 11, Wellington-street, Strand. An improved machine working by compression and expansion of air. (A communication.)

3063. R. A. Brooman, 166, Fleet-street, patent agent. An improved means or apparatus for shunting trains. (A communication.)

3065. C. G. Kopisch, Bishopsgate-street Without, merchant. Improved apparatus for propelling, steering, and ventilating vessels.

Dated Nov. 14, 1862.

3066. E. S. Cathels, Shrewsbury. Improvements in apparatus used in the manufacture of gas.

3067. E. B. Wilson, 5, Parliament-street, Westminster, engineer. Improvements in the method of conveying air, steam, gases, and fluids to oscillating or vibrating cylinders and vessels, and in the apparatus employed therein.

3069. S. Roberts, Sheffield, manufacturer. An improvement in frames for containing stoppered bottles and jars.

3071. V. J. Cassaignes, Gavundun, Canton de Montflanguin, France. Improvements in stereoscopes.

Dated Nov. 15, 1862.

3073. J. S. Clegg and J. Slater, Oldham, machinists. Certain improvements in carding engines.

3075. E. Kirby, Birmingham, merchant's clerk. A new or improved pulley for tightening the cords of window and other blinds.

3079. E. H. Duru, Poictiers, France, sculptor. An improved motive power engine.

3081. W. H. James, Old Kent-road, civil engineer. Improvements in steam engines.

3082. J. Wilson, 2, Royal Exchange-buildings, civil engineer. Improvements in hydraulic pumps. (A communication.

3083. G. Gray, Greenwich. Improvements in the manufacture of wheels.

Dated Nov. 17, 1862.

3085. C. Binks, Parliament-street, Westminster. Improved methods of obtaining oxygen and chlorine gases.

3087. W. Dobson, Nottingham, lace dresser. Improvements in lace dressing frames employed in the dressing of lace or other fabrics.

3089. W. Williamson, 133, High Holborn, mechanical engineer. Improvements in washing, wringing, and mangling machines.

3091. G. Richards, Caroline-street, Bedford-square. Improvements in the construction of ordnance and firearms, and in the projectiles to be used therewith.

Dated Nov. 18, 1862.

3093. J. Arbós, Barcelona, Spain, doctor. Improvements in generating certain gases for lighting and heating, and in apparatus employed therein.

3095. W. H. Burnett, Margaret-street, gentleman. Improvements in the mode of working telegraphic lines, and in instruments and apparatus employed for telegraphic purposes.

3097. C. W. Harrison, Lorimer-road, Walworth, engineer. Improvements in looms for weaving.

3098. C. Nield, Cheadle, Chester, accountant, and J. Hopkinsbn, York-place, Manchester, engineer. Improvements in fire alarums and indicators of temperature.

3099. R. Brown, Birmingham, gentleman. Improvements in warming and ventilating, more especially applicable to buildings, carriages, and ships, and in apparatus to be employed for that purpose.

3101. R. Beck, Peartree-cottage, Upper Holloway. Improvements in reading glasses and magnifiers to be simultaneously used with both eyes.

Dated Nov. 19, 1862.

3103. L. Lenzberg, 492, Oxford-street, manufacturer. Improvements in the apparatus for raising and lowering Venetian and other blinds.

3107. S. S. Brown, Ellesmere Works, Runcorn, Chester, manufacturer. Improvements in the manufacture of elastic fabrics or garments.

3109. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in tubular boilers, condensers, and superheaters. (A communication.)

3111. J. B. Edmonson, Manchester, railway ticket manufacturer, J. Carson, foreman, and J. Blaylock, Carlisle, machinist. Improvements in machinery for printing, numbering, and dating railway and other tickets.

3113. G. A. Bucholz, Montague-place, Clapham-road, engineer. Improved mode of manufacturing semolina and flour, and in apparatus to be employed in such manufacture.

Dated Nov. 20, 1862.

3114. J. T. Hutchings, Inkermann-terrace, Charlton, boot and shoe manufacturer. Improvements in the construction of waterproof boot and shoe soles.

3115. J. Jewsbury, Kinver, Stafford, machinist. An improvement or improvements in machines for raising weights, which improvement or improvements may also be applied to lathes.

3117. G. W. Holdham, Moll Spring, Honley, near Huddersfield, dyer. Improvements in preparing and dyeing

silk waste, flax, hemp, Indian or China grass, or other similar fibrous substances.

3119. R. A. Brooman, 166, Fleet-street, patent agent. A method of, and apparatus for, indicating and recording the course of ships and vessels. (A communication.)

3121. F. Seiler, 2, Thavies-inn, Holborn, gentleman. Improvements in motive power engines, and in apparatus for conveying and distributing motive power.

Dated Nov. 21, 1862.

3125. W. Sinnock, Nicholas-lane, mechanical engineer. Improvements in the treatment and combination of fibrous and and other materials, and in the arrangement of apparatus for manufacturing the same.

3127. J. Townsend, Glasgow, manufacturing chemist. Improvements in damping and preserving vegetable substances, and vegetable and other textile materials and fabrics.

3135. G. G. Sanderson, Parkgate Iron Works, Rotherham. Improvements in armour for fortifications and floating and other batteries.

3137. C. A. Orth, Church-road, De Beauvoir-square, saddler. Improvements in apparatus for obtaining and applying motive power.

3139. A. Sutton, Rue Boursault, Paris, engineer. An improved construction of time indicator for public vehicles and other uses.

Dated Nov. 22, 1862.

3141. W. Nethersole and C. Buckland, Swansea, engineers. Improved safety signals for firearm practice.

3143. C. De Bergue, Strangeway's Works, Manchester, engineer. Improvements in machinery or apparatus for the manufacture of metal reeds for weaving.

3145. W. Clark, 53, Chancery-lane, engineer. Improvements in candle lamps. (A communication.)

3147. J. Webster, Birmingham, engineer. Improvements in the construction of burners and blow-pipes.

Dated Nov. 24, 1862.

3152. J. Barclay, Vulcan Foundry, Kilmarnock, manager. Improvements in the construction and arrangement of rollers to be used in printing textile materials or fabrics, and in apparatus for drying and finishing the said materials or fabrics.

3153. J. H. Johnson, 47, Lincoln's-inn-fields, gentleman. Improvements in burnishing metal surfaces, and in the machinery or apparatus employed therein. (A communication.)

Dated Nov. 25, 1862.

3157. J. Moule, 15, Seabright-place, Hackney-road, manufacturing chemist. An improved method of deodorizing mineral oils and hydro-carbons.

3159. A. L. Woolf, Birmingham, wholesale jeweller. A new or improved metallic alloy.

3160. E. Wadsworth, Macclesfield, silk manufacturer. Improvements in machinery used in the manufacture of certain description of braid.

3163. G. Henderson, 7, Mincing-lane. Improvements in steam-engines. (A communication.)

3165. A. V. Newton, 66, Chancery-lane, mechanical draughtsman. Improvements in sewing machines. (A communication).

3167. T. M. Elton, St. Luke's Soap Works, Golden-lane, Barbican. Improvements in the manufacture of soap, and in the machinery employed therein.

Dated Nov. 26, 1862.

3169. J. Aspell, Middleton, Lancaster, manufacturer, and E. Booth, manager. Certain improvements in looms for weaving.

3171. F. Palling, Esher-street, Upper Kennington-lane. An improved fountain penholder.

3172. J. F. Foveaux, Strand, surgical instrument maker. Improvements in apparatus for pulverizing or dividing liquids into spray. (A communication.)

3173. W. Austin, Furnival's-inn-place, Holborn. An improved material for the manufacture of cartridge cases, applicable also for tubing and various other useful purposes.

3175. A. V. Newton, 66, Chancery-lane, mechanical draughtsman. An improved mode of preparing oxide of zinc as a pigment. (A communication.)

Dated Nov. 28, 1862.

3188. J. T. Caird, Greenock, engineer. Improvements in steam-engines.

3190. F. Boecke, Berlin, engineer. Improvements in sewing or uniting fabrics, and in the machinery or apparatus employed therein.

3196. J. Adams, Bridgehouse, Bow, and W. C. White, King-street, Regent-street. Improvements in apparatus for boiling and evaporating.

Dated Nov. 29, 1862.

3202. T. Lloyd, Liverpool, coach builder. Improvements in, and applicable to, the wheels of vehicles.

3206. J. C. Robertson, Gracechurch-street, and W. C. White, King-street, Regent-street. An improved tap or cock.

3208. D. Sutton, Banbury, farmer. Improvements in apparatus for washing linen and other fabrics and garments.

3210. A. R. K. Penson, Ferryside, Carmarthenshire. Improvements in apparatus used for warming railway carriages. (A communication.)

Dated Dec. 1, 1862.

3212. H. L. Emery, 72, Sloane-street, Chelsea, agricultural implement maker. Improvements in thrashing machines.

3214. G. F. Griffin, New Adelphi Chambers, engineer. Improvements in the permanent way of railways.

3216. J. Irwin, Wellingborough, Northampton. An improved machine for cultivating land.

3224. A. V. Newton, 66, Chancery-lane, mechanical draughtsman. Improvements in the construction of steam and other vessels. (A communication.)

Dated Dec. 2, 1862.

3226. H. Twelvetrees, Bromley, manufacturer. An improved sawing, filing, mortising, and turning apparatus.

3228. P. Brassert, St. Anne's-road, Brixton. Improvements in apparatus for saving life and property in cases of fire or burglary.

3232. T. Cook, Manor-place, Walworth, machinist. Improvements in envelope folding machinery.

3236. A. P. Charles, High-street, Wapping, soap and candle manufacturer. Improvements in candles and night lights, and in the lamps or apparatus for burning the same.

3238. H. J. Simlick, Osborne-place, Whitechapel. Improvements in the manufacture of cigar and pipe lights.

Dated Dec. 3, 1862.

3240. H. Wilde, Manchester, engineer. Improvements in electro-magnetic telegraphs, and in apparatus connected therewith.

3242. R. B. Thomas, Anderton. An improved apparatus for turning over the leaves of music.

3246. I. I. Abadie, Rue de Mulhouse, Paris, commission agent. Improvements in the manufacture of imitation lace and guipure veils and other analogous articles.

Dated Dec. 4, 1862.

3250. J. Grant, Albion-place, Maidstone, farmer. Improvements in the construction of turn-tables for portable railways.

3252. J. Braddock, Droylesden, engineer. Certain improvements in machinery or apparatus for effecting the separation of impurities from the water employed in steam boilers, and also for effecting the circulation of the said water.

3254. G. Lewal, 74, St. George's-road, Pimlico, gentleman. A hot-air apparatus in cast-iron or any other metal or substance consisting of prismatic tubes, to be applied to chimnies with flues and heat conduits. (A communication.)

3256. J. Robinson, Liverpool. Improvements in the construction of ships and vessels.

3258. R. Wallis, Basingstoke, corn and coal merchant. Improvements in apparatus for loading and unloading vessels and transporting sacks, casks, and other packages or parcels from one landing-place or stage to another, or to or from one warehouse to another.

3260. T. G. Webb, Manchester, flint glass manufacturer. Improvements in the manufacture of articles of pressed glass.

LIST OF SEALED PATENTS.

Sealed December 12, 1862.

1785. S. H. Huntly.
1789. A. W. Makinson.
1808. R. Stansfield and J. Dodgeon.
1816. J. B. T. Detuncq.
1822. J. W. Taylor.
1825. A. Warner.
1832. H. and J. Davenport.
1849. A. Ripley.
2762. F. G. Grice.

Sealed December 16, 1862.

1799. J. Warren.
1828. F. E. Schneider and J. Snider, jun.
1831. G. Simpson.
1836. A. F. Maigron.
1837. J. H. Redstone.
1842. T. Wilson.
1846. A. Webster.
1848. R. Cook.
1862. W. Clark.
1871. W. Clark.
1923. W. E. Newton.
1924. E. de Labastida.
1939. W. A. Gilbee.
1951. O. F. Byström.
1998. W. Ashton.
2298. M. A. F. Mennons.
2337. G. Davies.
2386. M. A. F. Mennons.
2387. M. A. F. Mennons.
2516. J. Rowell.
2815. H. Wilde.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2808. I. L. Bell.
2869. J. Chatterton and W. Smith.
2813. R. Emery.
2828. J. R. Johnson and J. S. Atkinson.
2832. S. C. Lister and J. Warburton.
2846. G. Hawksley.
2860. W. H. Harfield.
2876. R. P. Busk and T. Greenwood.
2901. R. S. Howden and E. Thresh.
2814. J. R. Breckon and R. Dixon.
2862. E. P. Holden.
2818. G. C. Watson.
2831. W. Robinson.
2833. J. H. Dickson.
2838. G. Bedson.
2839. G. Leach.
2842. A. Leslie.
2847. W. R. Crocker.
2867. R. Morrison.
2904. J. Ferrabee.

PATENT ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2785. P. A. le Comte de Fontainemoreau.
2894. J. Murdoch.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

From the *London Gazette.*

2134. W. Maugham. Manufacture of effervescent beverages.

2170. E. F. Prentiss and R. A. Robertson. Obtaining products from rock oil, coal, coal tar, and other like mineral substances.

2185. C. H. Plevins and H. Rider. Construction of colliery waggons, tubs, or corves.

2187. T. G. Webb. Manufacture of flint glass.

2194. A. and E. M. Denny. Manufacture of bacon.

2196. J. Thoma. Self-adjusting screw wrench.

2202. A. Priestley. Arrangements or apparatus applicable to locomotive railway engines and carriages.

2203. W. W. Burdon. Reducing wood fibres to pulp.

2208. J. H. Johnson. Construction of armour plates. (A communication.)

2212. F. H. M. C. D. C. de F. de Lacombe. Lighting and ventilating.

2217. B. Coombe. Apparatus or machinery for cleaning and decorticating.

2223. N. J. Amies. Manufacture of bearings, "journals," and "steps."

2227. J. Tatham. Apparatus for preparing, spinning, and weaving fibrous materials.

2235. T. De la Rue. Manufacture of pigments and writing inks.

2239. W. E. Newton. Compressing powder for cartridges. (A communication.)

2243. N. J. Amies. Manufacture of bearings or stops.

2244. J. Lancelott. Manufacture of ornamental chains from sheet metal.

2246. W. Gedge. Construction of ladders. (A communication.)

2257. A. Delrue. Preventing and removing incrustation in boilers.

2263. G. Sanders. Fire escapes.

2271. W. L. Boyle. Construction of chairs and footstools.

2277. W. Schnell. Extracting the sulphur and sulphurous acid from the oxy sulphuret of calcium. (A communication.)

2278. J. H. Johnson. Carts and other vehicles. (A communication.)

2290. C. E. Spagnoletti. Apparatus for signalling trains on railways.

2300. A. Shepard. Obtaining light.

2306. R. Barclay. Chronometers and other time keepers.

2313. F. Barnett. Lamp or lantern for street lighting.

2347. R. Harrington. Umbrellas and parasols.

2349. D. Moore. Breech-loading firearms.

2351. D. Moore. Revolving firearms.

2382. A. V. Newton. Machinery for printing from engraved plates. (A communication.)

2390. E. Lachenal. Gas meters. (A communication.)

2484. J. Saunders. Lamps.

2485. J. Saunders. Railway break.

2772. E. H. C. Monckton. Coils of induction, and in obtaining and applying power by means of electro-magnetism.

2848. T. Fearn. Manufacture of rods, poles, tubes, and other forms employed in the construction of various articles of furniture.

2857. M. C. A. Perkes. Revolving rudder. (A communication.)

2908. A. Shanks and F. Kohn. Hydrostatic presses.

2928. G. Mayall, jun., and J. Hollingworth. Apparatus for preparing fibrous materials for spinning.

2934. A. Guild. Preparing and treating the leaves and stalks of fibre yielding plants.

2942. C. Gubbins. Irons for ironing.

3066. E. S. Cathels. Manufacture of gas.

3111. J. B. Edmondson, J. Carson, and J. Blaylock. Printing, numbering, and dating railway and other tickets.

3160. E. Wadsworth. Manufacture of braid.

3198. W. E. Gedge. Clocks or time-keepers. (A communication.)

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SPECIFICATIONS PUBLISHED

For the Week ending December 19, 1862.

No.	Pr.		No.	Pr.		No.	Pr.		No.	Pr.		No.	Pr.		No.	Pr.	
	s.	d.		s.	d.		s.	d.		s.	d.		s.	d.		s.	d.
1343	0	8	1354	2	2	1366	0	4	1377	0	4	1389	0	8	1400	0	4
1344	0	6	1355	1	0	1367	0	8	1378	0	8	1390	0	8	1401	0	4
1345	0	10	1356	0	4	1368	0	10	1381	0	10	1391	0	4	1403	0	4
1346	0	4	1357	1	0	1369	2	2	1382	0	6	1392	0	4	1404	0	10
1347	0	8	1358	1	0	1370	0	4	1383	0	4	1393	0	4	1405	0	8
1348	1	0	1359	0	8	1371	0	10	1384	0	4	1394	0	4	1406	0	8
1349	1	8	1360	1	6	1372	1	0	1385	0	4	1395	0	8	1407	0	4
1350	0	4	1361	0	6	1373	0	8	1386	0	4	1396	0	4	1408	0	4
1351	0	6	1363	0	4	1374	0	4	1387	1	0	1398	2	4	1409	0	8
1352	0	4	1364	2	0	1375	0	4	1388	0	4	1399	1	4	1410	0	4
1353	0	6	1365	0	4	1376	1	10									

NOTE.—Specifications will be forwarded by post from the Great Seal Patent Office (publishing department) on receipt of the amount of price and postage. Sums exceeding 5s. must be remitted by Post Office Order, made payable at the Post Office, High Holborn, to Mr. Bennet Woodcroft, Great Seal Patent Office.

THE MECHANICS' MAGAZINE.

Contents of the Last Number:—

THE
MECHANICS' MAGAZINE.

LONDON, FRIDAY, DECEMBER 26, 1862.

ON THE FUSION OF STEEL IN LARGE MASSES.

AT a recent meeting of the Paris Academy of Sciences, Monsieur A. SUDRE read a paper on some experiments for this purpose made on an extensive scale by the orders and at the expense of NAPOLEON III. These trials were conducted at the Montataire iron works during the months of November and December, 1860, and January, 1861. The new process consists in melting any given kind of steel on the concave hearth of a reverberatory furnace. The furnace is heated by coal, while the steel is protected from oxydization by a bath of slag or scoria. This slag must answer to the following conditions:—It must not exercise any decarburizing influence on the steel, nor must it corrode the bottom or sides of the furnace. These conditions are fulfilled by the silicates of earthy bases, such as either the slags extracted from charcoal smelting furnaces, or common bottle glass. These substances can be obtained anywhere cheaply, or they can even be prepared in the melting furnace itself. The following are the results of operations that have been carried out in masses of 600 kilogrammes (nearly 12 cwt.) at once, and under the supervision of competent judges:—

1st, Even soft steel is found to melt easily under the slag covering. This is the fundamental point, *a priori*, the subject of much discussion; 2nd, the quality of the steel remains unaltered by the process; 3rd, slightly carburetted steel is found to melt in four hours, with a consumption of two parts of coal to one of steel, a consumption of fuel probably subject to future diminution; 4th, the same slag is found to answer for several successive meltings; 5th, the running out takes place with ease, as also regularly and continuously; 6th, a furnace made of good ordinary firebrick lasts eight days, corresponding to about thirty meltings.

The process is said to afford the following advantages:—1st, it does away with crucibles; 2nd, it causes a great saving in hand labour, and saves the workmen much painful and dangerous toil; 3rd, it reduces the consumption of fuel; 4th, it affords the means of fusing two or three thousand kilogrammes (nearly two to three tons) in the same apparatus; 5th, it offers a means of obtaining steel of any required quality and hardness, a very important advantage in the steel manufacture; 6th, the saving is reduced to two-thirds of that of the usual process. In France the expenses of melting in crucibles come up to about 150 to 200 francs per ton. The melting in a reverberatory furnace will not cost more than 60 francs, and this price can be still further reduced; and the cost of the apparatus for carrying out this plan is much less than with the ordinary process in which crucibles are used. All these advantages, distinctly proved by trials on several hundred kilogrammes at a time, seem to stamp it as a practical manufacturing process.

Mr. Frémy, well-known for his works on steel, who was present at this sitting of the Academy of Sciences, observed, that M. Sudre had rendered a great service to industry, if he had really solved the problem of melting steel in large masses. He could, however, express no opinion on the matter, not having been present at the trials.

M. H. Sainte-Clare Deville (who first produced aluminium in large quantities), observed, that he himself had seen 600 kilogrammes of steel melted at one time. It is very probable that Napoleon, in making these experiments, had in view to use this steel for large ordnance. "Notre ami l'ennemi," does not neglect details. The Austrians know only too well how "details" helped him to conquer at Magenta and Solferino.

IRON PLATED SHIPS AND PROJECTILES.

THOUGH the vast question of armour-plated ships is necessarily in a state of transition, there is no pause in their construction in America, France, or England. Since Mr. Whitworth sent explosive projectiles through five-inch iron plates, ships built on the "Warrior" principle have been at a discount. What Mr. Whitworth can do a foreign Government can do; and should an engagement take place, a French man-of-war, armed with Whitworth guns and projectiles, would make short work of either of Admiral Stuart's squadron, including the "Warrior," "Black Prince," "Resistance," and "Defence," which behaved so "wonderfully" during their recent cruise between Lisbon and Gibraltar. It is very encouraging to know that all these vessels have proved themselves to possess "excellent weatherly qualities." The admiral, it appears, determined to test the ships in every possible way, and each is described as being admirably handled. So far so good. But if they can be riddled with Whitworth explosive projectiles, their "weatherly qualities" would avail them but little. If our artillerists could merely make holes in iron-clad ships, the evil might be remedied, to some extent at all events, by plugs. But what good would be plugging up a hole when the destructive missile is lodged somewhere *in* the ship. Mr. Whitworth, by his recent achievements, has made himself, as the French would say, master of the situation. His gun may not be all that it is painted. It may occasionally burst, to the evident discomfort of the artillerymen. Rapid firing of the gun may derange its inner surface. Even Mr. Whitworth may not be the sole inventor, either of the gun or of his projectiles, as more than one of our contemporaries have taken considerable pains to show. But, after due allowance is made for all these objections, it cannot be denied that Mr. Whitworth has established facts which have shaken the faith of our Admiralty Lords in the invulnerability of iron ships. We await, however, with considerable interest, further Whitworth and Armstrong experiments.

In the meantime the Admiralty are going on building ships; possibly, when they are built, they will be found next to worthless. During the last session of Parliament we heard a great deal about Capt. Cole's cupola ships. Money was voted, and preparations were made for the construction of, we believe, two ships on Capt. Cole's principle. We should be glad to know what progress has been made in this direction. Is the gallant captain as hopeful as ever? Is he developing his idea slowly and surely, with the intention of startling us some fine morning with a magnificent success? Whatever progress is being made, whether slow or fast, we at all events hear but little about the construction of cupola ships.

Mr. Reed, it appears, is making "rapid progress." The "Enterprize," under his superintendence, in Deptford Dockyard, is in an encouraging condition. The planking of the bottom is now completed, and the false keel has been filled and coppered. The deck of the battery platform, and the deck above the battery, are being laid, and the timber portions of the ship, we are informed, are rapidly approaching completion. The form of the "Enterprize" appears to be much admired, and it it is predicted that she will possess excellent qualities as a sea-going ship. Officers of the Ordnance Department have surveyed the ship, for the purpose of arranging the details of the armament, and have found that ample accommodation has been afforded for four Armstrong 110-pounders, even when mounted upon carriages and slides of the largest kind. So far, then, the vessel bids fair to be much superior to ships built on the cupola principle, which are intended to carry only one gun each. But is the "Enterprize" to be fitted with Armstrong guns? We must say we paused and rubbed our eyes on seeing this announcement. We always considered Mr. Reed a staunch opponent of the Armstrong gun, and he has earned the reputation of saying the strongest things against it. Has Mr. Reed changed his opinion on the efficiency of the Armstrong system of artillery? Sir William has not been in the ascendant of late. In fact, Mr. Whitworth, in the minds of all unprejudiced persons, has distanced him in the race of gun-making. It is, therefore, not at all likely that Mr. Reed thinks more of the Armstrong gun now than before the "Enterprize" was commenced. If not, why does he permit himself to be imposed upon by officers from the Ordnance Department? Is it for the sake of peace and quietness he is so submissive? Or does he say that he has nothing to do with the character of the guns the "Enterprize" is to carry? Mr. Reed should certainly, we think, have a voice, to say the least of it, in the selection of guns for the "Enterprize." He has either interfered in the matter, or he has not. If not, then, unless he has changed his opinion, he is winking at the perpetration of a wrong. If he has told the Admiralty his opinion, then is his voice overruled by the "officers appointed by the Ordnance Department."

Several inventors and others, including Mr. Reed and Capt. Coles, have submitted plans to the Admiralty for cutting down our large men-of-war and planking them with iron. We have, some time since, commenced this "reconstruction of the navy." As we appear to be influenced to a great extent by what the Americans do, and endeavour to profit by their experience, it is not improbable that we should pause now that the American iron-clad vessel "Eastport" has proved a failure. This vessel was taken by the Federals from the Confederates. She has since been thoroughly mailed, but her keel was too weak, and the weight of metal put on her broke her back. The failure of the vessel, says an American paper, is a trifling matter compared with the principle it apparently involves. The "Benton," another Federal iron-clad vessel, has also failed from a similar cause. It would seem that an exclusively wooden vessel cannot be mailed heavily, and retain her buoyancy and usefulness. If wooden vessels are so susceptible of destruction by plating, an important point is settled, as the converting of old frigates and liners into iron-clads must cease. Possibly the "Eastport" and "Benton" were radically weaker than our substantial frigates; if so, her failure should only lead to enquiry and experiment. Enquiry and experiment should always precede important changes, instead of succeeding them, as is frequently the case in this country. We act first and learn afterwards, instead of learning first and then acting.

We will conclude these discursive observations with a word or two on the fouling of iron ships. It is well known that, when copper and iron are placed in contact, galvanic action takes place, and the iron soon gets destroyed. The greatest disadvantage that iron ships have to contend with is their liability to become foul. Hence, the many inquiries which have taken place, and the many inventions which have been patented to protect the hulls of iron ships from fouling. Various preparations for the purpose have been applied in this and other countries, and we have from time to time called attention to new inventions and new suggestions on the subject. A short time since H.M.S. "Triton," which had been coated with a preparation of copper, had, after a voyage, to undergo a scraping, and tons of oysters, barnacles, &c., were removed from her bottom. During the process of cleansing, the scrapers actually rubbed through the iron plates, so completely had they been destroyed by galvanic action. We now learn that the French ship, "Le Gloire," which had lately been examined, is in a similar condition. All the iron plates under the water line will have to be removed, as they have been converted into something like plumbago by galvanic agency. This circumstance will no doubt call the attention of the French Government to the subject; and perhaps the nation which first adopted iron war ships will also first invent some mode to prevent them fouling.

THE EFFECTIVE DISCHARGE OF PUMPS.

In our present number, page 415, will be found the results of an examination, by Mr. Zerah Colburn, C.E., into the useful effect of the two principal centrifugal pumps that figured in the late Exhibition. Without further alluding to this interesting paper, it will be at once seen that one of those two centrifugal pumps gives a remarkably high per centage. This one is working at a speed, in fact, nearly double as high as the other. We are inclined to hazard the opinion that the more continuous and equable current thus produced will somewhat account for the difference between the performance of the two pumps.

In the Jury report of the special committee on fire-engines, a very remarkable fact is shown in the tables of the trials. In some instances, there is actual gain over and above that due to the cubic contents of the pump itself. In one case, this was as much as 14 per cent. It is as well to state that the special Jury have not given the power expended in working these fire-engines; they have only stated the number of men at the handles. In our experience in mining pumps, we have noticed a similar case in relation to a 12 in. diameter "draw lift."

This remarkable fact is probably due to the quick current of water through the clack valves; this current keeping the valves open even when the bucket or plunger (as the case may be) is stationary. It appears to us that the importance is often overlooked of arranging pumps in general, and double pumps in particular, in such wise that the stream of water is as continuous as possible.

There was a double pump in the western annex in the Exhibition, sent by Messrs. Farcot and Sons, of Paris, that appeared to obtain a continuous stream in a very simple, and, as we believe, rather original manner. As far as we could make out, in the absence of drawings, this double pump appeared to consist of two equal pump buckets, working *parallel* to each other in two cylinders.

The two buckets being moved up and down together, the first bucket draws in water by its upper surface, and then causes it to pass through the second bucket. In going up, the second bucket raises the column of water by its top surface, and the lower surface sucks the water through the first bucket. We have even seen it proposed (but feel rather doubtful as to its realization) to work a common reciprocating pump at a high speed, and thereby cause a continuous flow of water through the pipes after once the action was begun. In this case, "*Est le premier pas qui coute*," as the French say. As is well known, the loss in useful effect of reciprocating pumps, caused by the leakage of the clack valves, is often more than 1-10th, although this may be much diminished if these parts be kept in good working order—a fact which may also help to account for the surplus water delivered at the fire-engine trials in Hyde-park, on the 1st of July last, the engines tried being newly made. The minimum of loss answers to a fixed speed of piston, varying according to the state of the pumps or their construction. According to D'Aubuisson, the loss by the leakage of the clack valves is in an inverse ratio to the length of the stroke of the bucket or plunger. A badly-packed or worn away bucket lets the water fall back; badly-fitted clacks do not shut tight, or do not open and shut at proper times. It is very important that the stroke of a pump, a large one especially, should, by a short stoppage, give time to the valves to open and shut. If the piston has to drive down the clack, the sudden closing causes a reaction of the column of water, and the higher this column is, the greater the percussion of the valves on their seats. We believe that the plungers of the large pumps in Cornwall work at the rate of about seven to eight strokes per minute, rising at the rate of about 260 to 280 ft., and descending at the rate of 85 ft. per minute.

II.

FRENCH SUBMARINE CABLES.

Schiller makes one of his characters say, "It is wise to take good counsel before sailing out of the safe harbour." As the Atlantic submarine cable adventure is on the *tapis*, it will not be amiss to look around us and see how other nations have fared with similar enterprizes. According to the French papers, the communication of the cable between France and Algiers has been somewhat interrupted, after working with tolerable success for about a year. The communication is broken between Algiers and the Balearic Isles; it is supposed about 240 miles from the town of Algiers, in the middle, therefore, of the Mediterranean. *Le Moniteur Universel* informs us that a Government vesssl has been sent out to raise the cable, which it has already done to the extent of several miles.

A short account of the Algerian cable will not be devoid of instruction. It was, in the first instance, laid direct, without any intermediate station, between France and Africa. This was done in the young and palmy days of submarine telegraphic engineering, when the self-confidence of its youth caused it to oversee difficulties, and to disbelieve in the word impossible. This arrangement, as is well known, proved to be a failure as sudden as it was complete, and the line was then made to touch at the islands of Sardinia and Corsica.

After working for some months with great irregularity (an irregularity so great that telegraphic despatches were often received *after* the explanatory written letters), the cable in the end refused to speak at all. It was then seen that it would be safer to make it touch at the Balearic Isles, and with great difficulty the cable was again fished up for this purpose. The cable thus laid has, in its turn, also suddenly refused to act. The French scientific press now advises the telegraphic administration to take the line over Spain, and from thence to choose the shortest route to Algeria, or it could even be taken over Gibraltar, and along the coast of Morocco. The French papers say that, "if the Sultan of Fez has not the power to protect the line thus carried along his coast, this could be done by the French Government. This would also be a double gain, as the pirates of Riff could be watched by the same means."

Truly enough, submarine cables ought to be protected by international law. No civilized nation would refuse its signature to such a treaty. *La Presse Scientifique* criticises the apathy of those men of science who did not use the telegraphic cable when it existed to take simultaneous astronomical observations. It concludes with an irreverent sneer at the "common-place messages to be found in any Mass-book" (*sic*) we Anglo-Saxons transmitted during the short existence of the Transatlantic cable. It also translates the sublime message that passed between England and America by "Peace to the well-disposed men of the earth!" This is something like the story of the Frenchman translating "The Green Man and Still" into "*L'homme vert et tranquille!*"

II.

INTERNATIONAL EXHIBITION.
JURORS' REPORT.

(Continued from page 401.)

Class X., Section A.—Civil Engineering.

In the space beneath the caisson compressed air was used to expel the water and to allow the men to work, and it was also employed to force down the cylinders to the requisite depth, the air pumps being worked by a steam engine from above. Within the caissons workmen were employed to remove the gravel, &c., from under the exterior edges as they descended, whilst the great mass of the material, which was cast by hand to the centre, was removed by means of the dredging apparatus worked by a steam-engine upon the platform above. The novelty and the chief cause of the efficiency of this apparatus consisted in the centre cylinder being open to the atmosphere at the upper extremities, and plunged in the water at its lower end, by which means the great mass of the material could be removed by the dredging apparatus much more rapidly and economically than if all the material had been hoisted in buckets through the air-locks, in the usual closed cylinders. The caissons were thus carried down to the requisite depth below the ordinary level of the Rhine most successfully, in a much shorter time, and at infinitely less cost than by the usual method, and the piers were founded at such a depth below the scour of the current, as to give every reasonable guarantee of their stability. The superstructure, which was executed under the supervision of M. Keller, the engineer-in-chief, and the Baron Kagenech, engineer of the Grand Duchy of Baden, does not offer any remarkable features, although it has been well executed and perfectly answers the purpose for which it was intended. To M. Vuigner, chief engineer of the Eastern Railway Company of France, and M. Fleur-Saint-Denis, engineer of bridges and roads, and author of the project, have been awarded a collective medal, for the ingenuity of design for these piers and foundations; and to Messrs. Castor, the contractors, also a medal, for the intelligence of their arrangements and the successful execution of this work, and also for a similar application at the bridge of Argenteuil.

The next bridge worthy of mention is that over the Garronne, at Bordeaux, to connect the Orleans Railway with that of the South on the

other side of the river. This extensive work was originally designed by the late M. Alfred Bommart, engineer-in-chief of bridges and roads, and it was after his decease carried into effect under the direction of M. Surell, engineer-in-chief of bridges and roads, by the enterprising contractors, Messrs. Pauwels and Co., under the superintendence of M. De la Roche-Tolay, engineer of bridges and roads, chief engineer of the company, and M. Regnault, engineer of bridges asd roads, resident engineer. The total length of this bridge is 500 metres, and it consists of seven openings, the two extreme spans being 57½ metres each, and the five other spans 77½ metres from centre to centre of the piers.

The superstructure is formed by wrought-iron girders upon the trellis principle, which require no further remark, than that they are well executed. The foundations of the piers were executed by means of cast-iron cylinders, which served as air chambers, having the air lock on a platform attached to the upper part of each cylinder, and which was removed, as occasion required, to replace another length of cylinder. These cylinders were sunk in pairs, side by side, by the compressed air system of M. Triger, and the pressure was given to the cylinders by hydraulic presses. The bed of the river was composed of mud and sand, through which the cylinders were forced, with a depth of water varying from 7 to 13 metres, a current of from 2 to 3 metres per second, and a strong tide rising 6 metres. These were some of the difficulties to be contended with, and which were very successfully overcome by the intelligent foresight of the engineers and the practical experience of the contractors. To MM. A. Bommart, De la Roche-Tolay, and Regnault, the engineers, has been awarded a collective medal for the boldness of the design, and the simplicity and economy of construction of this bridge; and the same recompense has been also awarded to Messrs. Pauwels and Co., the contractors, for their intelligence in carrying into effect the designs of the engineers, and more especially for improvements in the application of hydraulic presses for forcing down the cylinders, on the system invented by Messrs. Fortin-Hermann and Co.

In addition to the above bridges, or viaducts, there are models of several others, of which the superstructure, piers, and abutments, are of masonry. The bridge at Chaumont, by M. Decomble, engineer of bridges and roads, although displaying nothing original in the design, or construction, is well executed, and is creditable to the engineers and contractors by whom it was designed and constructed.

This important work, which is nearly 700 metres in length, 53 metres in height, was constructed in 14 months; its execution is perfect, and the general effect is very good. To M. Decomble, the engineer intrusted with the execution of the work, has been awarded a medal; and to Messrs. Parent and Shacken, contractors, and Monsieur Gourdin, their engineer, honourable mention for their intelligent co-operation and the excellent arrangement of their executive staff.

The viaduct of Nogent, on the line of railway from Paris to Mulhouse, consisting of three arches, each of 50 metres span, and of 30 arches each of 15 metres span, all in masonry, deserves mention, as a well-designed and excellently-executed work, for which honourable mention was awarded to M. Pluyette, engineer of bridges and roads, intrusted with the execution of the work.

The bridge of Napoleon, at St. Sauveur, in the Pyrenees, consists of one semicircular arch of 42 metres span in masonry. The foundation presented great difficulty in consequence of the mountain torrents swelling the course of the Cave de Pau. To M. Marx, engineer-in-chief of bridges and roads, and to M. Bruniquel, resident engineer, were awarded collective honourable mention for the good execution of this boldly-conceived work.

There must also be mentioned the successful execution of a large bridge over the Vistula, near Dirschau, designed by M. Lentze, for which, and for the ingenuity of the inclined planes on the Oberländische Canal, designed by M. Steenke, medals have been awarded to the Minister of Commerce of Berlin, and to the Royal Engineer Works at Dirschau (Zollverein, 1,338). To Messrs. Schnirch and Fillunger (Austria, 626), for the bold and successful bridge over the Danube Canal at Vienna, and to the State Railway Society (Austria, 628) for their good structure, introducing improvements by Rupert in lattice bridges, and for the excellence of execution of these and other important works, medals have been awarded.

To Messrs. Klett and Co., of Nuremberg (Zollverein, 180), a medal has been adjudged for the boldness of the design and the successful execution of the railway bridge across the Rhine, at Mayence, on the system introduced by M. Pauli. This bridge has a very large span, and is of singularly simple construction, offering great facilities for repairs and for keeping in order, by painting, &c., all parts being accessible.

To the Commissioners of New Brunswick was awarded honourable mention for the utility of the bridge works, of which models were shown.

II.—HARBOURS AND DOCKS.

WITH regard to this department there are several works particularly worthy of notice; and amongst the most important must be mentioned the great "digue," or breakwater of Cherbourg. The history of this great work is very remarkable, and the structure itself presents a great variety of operations, equally instructive from their failure and their success. There have been tried here consecutively the ingenious yet abortive dea of the wooden cones filled with small rubble stone—the small rubble upon the *pierre perdu* system, which was equally unsuccessful—then the larger rubble system—and finally the béton and masonry systems, by means of which this great work has been eventually completed. All these plans exhibit considerable ingenuity and skill; nevertheless, it must be admitted that the construction of this great work, at the outset, evinced great deficiency in the knowledge of those first principles which should guide the engineer in the construction of works of this nature and magnitude.

The breakwaters of the Carthaginians at Tyre and Sidon, of the Greeks at Athens, Halicarnassus, Ægina, and in numerons other places, as well as those of the Romans at Ostia, Civita Vecchia, Ancona, Naples, and other ports in the same vicinity, show that the simplest and most economical mode of constructing barriers, or breakwaters, to resist the violence of ocean storms, was by throwing down, or depositing, rough undressed blocks of stone, as raised from the quarries, and allowing them to form their own slope, or inclination, by the action of the waves, until finally the masses, thus thrown down, become settled, when their permanence was further augmented by the growth of seaweed and the drift of the sand into the crevices; so that these works have remained unaltered until the present day. The experience, however, derived from these works does not appear to have been taken advantage of until within a comparatively recent period, and hence the variety of systems introduced in the construction of the breakwater at Cherbourg. In fact, instead of starting from the point of demonstrated success, a comparatively tentative process would appear to have been pursued; whereas, if the knowledge of the past had been taken advantage of, much trouble and cost would have been avoided.

It is to be regretted, in an engineering point of view, that the position of the breakwater should have been determined by purely military considerations, which demanded a direct line between the forts Pelee and Querqueville, thus materially reducing the extent of the roadstead.

The history of this great work, as given in the works of M. de Cessart and MM. Alexis de Tocqueville, Cachin, and Bonnin, &c., as well as in the "Annales des Pontset Chaussées," conveys much information. Due honour should be given to the several able engineers-in-chief and to their subordinates, who have brought the work up to its present satisfactory state. The names of the chief engineers are:—

Captain la Bretonniére, Royal Navy, 1777 to 1782.

M. de Cessart, inspector of bridges and roads, 1782 to 1792.

M. Lamblardie, inspector-general of bridges and roads, 1792 to 1793.

When an interval occurred until 1802, when the works were resumed.

Le Baron Cachin, inspector-general of bridges and roads, 1802 to 1823.

M. Fauques Duparc, divisional inspector of bridges and roads, 1823 to 1838.

M. Reibell, inspector-general of bridges and roads, 1838 to 1853, when the work may be said to have been completed, and to the latter eminent engineer and his able coadjutors, MM. Virla, Mahyer, and Bonnin, engineers of bridges and roads, and to their predecessors and assistants, a collective medal has been awarded, on the completion of this important work, after so many years of persevering efforts, due to the judicious use of all the resources induced by the progress of marine construction.

It is not any detraction from the merit of the many able engineers who have been employed upon this great work, to say that every allowance must be made for the want of knowledge and experience which existed at the time when it was commenced; and as a matter of scientific inquiry, it is most interesting to place on record all the facts of the progress, and to compare the modes employed with those of the present day.

The new port of Marseilles is a great work, which has been planned and executed upon an extensive scale by M. Pascal. engineer-in-chief of bridges and roads. It is situated to the eastward of the old natural harbour, formed by a creek, which was taken advantage of, and around which the town sprung up. The new artificial harbour consists of a series of wet docks, or basins, formed by moles, or breakwaters, constructed in the open sea. They run parallel to the shore, and communicate with each other by openings and locks through the cross walls which separate them from each other. The outer, or boundary sea wall, connecting the whole system, answers the double purpose of a breakwater on the outside, and a quay wall on the inside; and at each end of these docks is an outer, or entrance harbour, so that vessels can use either, according to circumstances, and can pass from one to the other, as convenience may require. There is, also, a connection with the old harbours. The general design of this harbour is good, but the sea entrances are scarcely sufficiently protected against the swell of the sea during storms. The details of the construction are entitled to considerable credit, for every class of materials has been utilized to the greatest extent; the smallest stones being used in the interior and the largest in the exterior, where the face is exposed to the greatest action of the sea. The outer face, or sea slope, of the great exterior breakwater is protected by large masses of béton, formed into artificial blocks, each weighing from 25 to 30 tons, which are said to be immoveable by the most violent action of the waves; and so far they have resisted the disintegrating effects of the sea, and the atmosphere and with success, although further experience is necessary, before the béton masses can be pronounced to be indestructible. Great credit is due to the French engineers, amongst the earliest of whom may be mentioned M. Poirel, for reviving this ancient system of building, and to M. Pascal, the engineer-in-chief, the award of a medal is made for the methodical and scientific direction of these important and extensive works, including the utmost economy, without sacrificing the excellence of construction, and to Messrs. Dussard, Brothers, of Marseilles, the contractors, honourable mention for their intelligent assistance in the execution of important parts of the works.

The lock-gates of the docks, at the port of St. Nazaire, are specimens of timber constructions of very large dimensions, not requiring the use of any logs of large scantling; and M. Watier, engineer of bridges and roads, the author of the design, and the constructor of the first gates on this system, to whom honourable mention has

been awarded, is entitled to great credit for the boldness of the design and the ingenuity of the construction, in which he was strenuously supported and succeeded by M. Leferme, engineer of bridges and roads. The general works of the port being first under the direction of M. Jegou, and subsequently under M. Chatoney, engineers-in-chief of bridges and roads.

The lock of the citadel and the graving dock of the Eure basin at Havre are important works. The graving dock and its entrance locks are designed upon a very large scale, with the view of receiving the vessels of heavy tonnage engaged in the trade with New York; the depth of water on the cill being 8½ metres at low water of spring tides, and the locks being 30½ metres in length. The construction of the walls is of the best quality, and much ingenuity has been exhibited during the progress of the works, as well as in the general designs for the extension of the port of Havre, for which there has been awarded a collective medal to M. Bouniceau, engineer-in-chief of bridges and roads, and to MM. Bellot and Lemaitre, resident engineers.

(*To be continued.*)

THE ATLANTIC TELEGRAPH.

The above incline of 1 in 6 is the steepest gradient that has been proved to exist in the ocean bed *on the* line adopted in 1858, by the Atlantic Telegraph Company, for laying their cable between Valencia and Newfoundland. Yet parties interested in rival localities and competing lines have not hesitated to describe this gentle slope as a "*precipitous clift*," and as unsafe and unsuitable for laying a cable, although the bottom has been shown to be formed of the softest ooze, in comparison of which the finest sea sand might well be called rough and rugged.

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

SIR,—The above sketch appears to me the most concise way of refuting a misrepresentation which has been very industriously circulated, regarding the telegraph line between Valencia and Newfoundland, and I place it at the head of this letter, which I would beg of you to insert as a reply to one which appeared in your paper of the 20th ult., from Professor King, of the Queen's College, Galway.

In undertaking to point out the best place for landing an Atlantic cable, Professor King appears to have totally misapprehended the principles essential to guide us in such a selection; and when he proceeds to point out the merits of one line, and the demerits of another, as resting places for the cable, he is not always correct as to details, and when accurate, the reason he gives for his preference are often trivial and inconclusive.

It may appear presumptuous in me, who am not a man of science, to speak thus; but I have taken so much interest in this question from its commencement, and I have come into contact with so many of the acknowledged leaders, scientific and practical, of the telegraph undertaking, that I feel tolerably strong on the subject, and I hope not to advance any opinion that cannot be maintained; at any rate, I cannot be mistaken as to the principles which governed the promoters of the Atlantic Telegraph, in selecting their line and their landing-place, and which ought, I feel certain, to guide any persons engaged in a similar undertaking.

The first consideration, where the distance was inevitably so great, would naturally be to make their ocean line as short as possible, and with that view, to select the points at either side of the Atlantic, which, being otherwise suitable, were nearest to each other. They would next proceed to ascertain whether the line connecting these two points was suitable; requiring not only that the ocean-bed should be fit for the reception and preservation of a cable, but that water of considerable depth should continue up to the landing-place, which should be on a shingly or sandy beach. They would further require that the cable should lie as free as possible from all risk of injury by anchors of vessels or trawls of fishing boats; and lastly, they would desire, though not absolutely essential, that the landing-place should be in or near a good harbour, for greater facility in laying the cable, and, if necessary, in under-running it.

Now, I can say, without hesitation, that not one of these requirements has been lost sight of by the promoters of the Atlantic Telegraph, and that every one, without exception, has been secured by their selection of Valencia.

On the other hand, how does Professsor King appear to view these principles? As to the first, he must be aware that Galway is 62 miles further from the opposite shore of the Atlantic than Valencia; he, therefore, would ask the company to add to their already sufficiently arduous undertaking* 62 unnecessary miles of cable, of which a considerable proportion must be of the heavy or stone-end description, costing £400 per mile. But the expense which this involves is but a small part of the burden which it would throw on the company. The greater part, if not the whole, of the extra miles of cable, would be laid in ground where it would be peculiarly exposed to injury from anchors of drifting vessels, and trawls of fishing craft; in fact, the most dangerous, in this respect, which could be found in the whole of the west coast of Ireland. He would thus needlessly imperil, not merely the value of this extra cable, but, in truth, the whole of the vast capital invested in this great undertaking. We have all heard of "*going further and faring worse*" as an operation to be avoided, but to find it deliberately recommended, where such interests are involved, is not a little surprising.

Again, admitting for the moment that the Professor makes out, as a result of the recent soundings, that a good ocean bed for the cable can be found in a line directly west from Galway, he entirely overlooks the other equally essential requisites. He deliberately brings the cable into ground most liable (as I have shown) to danger from anchors, and then makes it land through what he properly calls "*foul ground*," which he further describes as "*hummocks of granite and syenite*." If I did not see it in black and white, I could hardly believe that any one could make such a suggestion, and then go on to assert that for the Galway cable this rocky ground would not only "*not be injurious*," but would be "*advantageous*." Why? Because the cable would thereby escape danger "*from trawling and fishing lines and anchoring of vessels*,"—that is, being aware of having brought his cable into the most dangerous ground on the whole coast, he is obliged to escape from this Scylla into a Charybdis of "*granite and syenite rock*."

So far as to the general principles on which Professor King would select a landing-place. Now, as to his reasons for considering the line from Valencia to Newfoundland less desirable than that from Galway, they appear to me to be four. 1. That the line from Valencia, till it descends to the deeper ocean-bed, is less gently undulating than that from Galway to the same parallel. This may, very possibly, be true, but certainly not to the extent claimed by the Professor, for he charges against the Valencia line a sounding of 525 fathoms, which exceeds by over 100 fathoms anything shown in that region by the Admiralty chart, in the line sounded for the telegraph by H.M.S. "Cyclops;" but admitting, for the sake of augument, his 525 fathoms, what does that involve? Merely the paying out of a few extra hundred fathoms of the lighter description of cable, say, at the outside, a cost of £100 to £150. Against this the Professor will have to debit the Galway line, with the 50 or 60 extra miles of cable, with all the continental evils which I have already pointed out.

2. He states that the dip on the Valencia line, into the deeper ocean-bed, is more rapid than in the other line. Now, even if this were proved to be true, it could not be considered a matter of serious moment, unless it were shown that the slope is very much steeper than anything that has yet been ascertained; but I must altogether question the fact the Admiralty chart shows, a sounding of 1,240 fathoms, nearly due west of Valencia, which, being less than is found on the same parallel west of Galway, would lead to an exactly opposite conclusion.

3. He asserts that the Valencia line crosses two valleys, one of half a mile, the other of three miles in depth. Again, I must question this assertion. I distinctly remember that the deepest sounding found by the "Arctic" was 2,100 fathoms, and by the "Cyclops" 2,424 fathoms; but if even they had attained the depth he claims of 2,640 fathoms, this would not prove a "*valley*" which is generally defined as a "*hollow between hills*," and which was not found either by the "Arctic" or "Cyclops."

4. Assuming a "*valley*" of this depth, he supposes the "*eastern side*" of it to be rocky, from the presence in the soundings of a shell called "*discina, which lives fixed to stones*," and he talks of this as a "*difficulty*." Now, it strikes me that, if these shells came up from the bottom in an appreciable state, the bed cannot fairly be considered "*difficult*" or dangerous for a cable. But surely the Professor must have forgotten having said, a few sentences before, that it was "*advantageous*" to the Galway line that the cable should land through "*hummocks of granite and syenite*;" and he will find it hard to explain how the certainty of rock in shallow water can be "*advantageous*" to one line, while the remote possibility of its existence, in water of great depth, can be a "*difficulty*" to another.

I think, Sir, I have made out my case, that Professor King has misapprehended the principles on which a landing-place for a cable should be selected, and has shown no good reason for preferring the Galway line; but, in conclusion, I beg to say a word on a point which has no direct connection with Professor King's letter. Only two objections have heretofore been made to the Valencia line—1, The supposed "*precipitous clift*," at about 200 miles from the Irish shore. 2, The nature of the coast (generally rocky and iron-bound) in the vicinity of the harbour, which might be supposed prejudicial to the permanency of a cable. As to the first, the fallacy of the "*precipitous clift*" is sufficiently exposed by the diagram at the head of this letter. As to the second, I can give, not a theoretical, but a very practical answer. The cable was brought to Valencia in August, 1858. It has lain as then placed since that time, and in that interval of four years has endured storms of no ordinary severity. I have recently under-run it in a position (a mile or two outside the harbour) where, if at all, danger might have been expected. I have taken up about a mile of it, and found it in such perfect preservation that, without delay and without any repairing, I have used it as a part of a submarine connection between this island and the main land, and through it we have since telegraphed thrice a day, without a single interruption, the state of our weather to the Statistical Department of the Board of Trade. I hope this may be considered a sufficient proof that the landing-place selected by the Atlantic Telegraph Company was not an unsuitable one.

Apologizing for the length of this letter,

I am, &c.,

P. FITZGERALD, Knight of Kerry.

Valencia, Dec. 13, 1862.

* If, as would appear, Professor King intends to stop at Cushla Bay, "10 miles west of Galway," he would certainly be chargeable with 10 miles less of cable, but he must then provide telegraph connection between Cushla Bay and Galway.

BURSTING OF A FLY-WHEEL.—According to a New York paper, a large fly-wheel, 20 ft. in diameter, at a rolling mill, in Philadelphia, lately burst while moving at the high velocity of 200 revolutions per minute. It was used on machinery for rolling steel plate for saws, springs, &c. A portion of the wheel passed up through the roof of the building. A man was killed. The machinery connected with it was broken to pieces before the engine could be stopped. The velocity of a wheel, 20 ft. in diameter, making 200 revolutions per minute, is over 140 miles per hour.

CENTRIFUGAL PUMPS.

WE have received the following useful letter, addressed to Messrs. Gwynne and Co., of Essex Wharf, by Mr. Zerah Colburn, Civil Engineer :—

MESSRS. GWYNNE AND CO.

Gentlemen,—In accordance with your instructions of the 27th ultimo, I at once examined your engines in the International Exhibition.

The engines and pump were run experimentally on the 29th, 30th, and 31st of October, and on the 1st and 3rd instant (November).

The only trials of your pump, upon the general results of which I am disposed to place much reliance, were those made on the 4th inst.

The trial of greatest interest was to ascertain the efficiency of the pump, both as to the absolute discharge, and as to the proportion which the useful work done might bear to the power expended.

The engines and pump being run continuously at the rate of 200 revolutions per minute, the water in the lower tank fell 1 ft. 9¼ in. below where it originally stood before the pump was started, and the water was raised in the upper tank to a maximum height of 1 ft. 8⅛ in. above the crest of the weir, over which flowed an unbroken stream 9 ft. 8½ in. wide, and 12¼ in. in thickness, as measured over the crest of the weir, and occasionally splashing against a board placed 15 inches above the weir. The water, as it rose in the upper tank, presented a curved surface, the highest point of which corresponded to a maximum lift of 20 ft. 6½ in. above the level at which the water stood at the same moment in the large tank below. It was only the water which rose in, and near the centre of the 30 in. pipe, however, which reached this extreme height. It will, however, be making an ample allowance for the somewhat inferior velocity of the water rising in contact with the inner surface of the pipe, if we take the mean lift of the whole body as 20 ft. 4⅛ in. or to a level of 1 ft. 6⅛ in. above the crest of the weir. The velocity of the water ascending the pipe, altogether 20 ft. long, was rather more than 12 ft. per second, and thus the friction of the water in the pipe (the overcoming of which friction formed part of the true "duty" of the pump) would, by Wiesbach's formulæ (accepted by most English engineers), be equivalent to an additional lift of 4½ in., making the total corrected lift 20' 8¾" = 20.73.

The corrected mean rise of the water above the crest of the weir, 1 ft. 6⅛ in., would be perhaps the least which, under the circumstances could have been expected to give an overflow 12¼ in. thick on the weir itself. Taking the true head as 1 ft. 6 in., the full theoretical discharge, without loss of any kind, would be 5733·22 cubic feet, and as the coefficient to be applied in obtaining the actual dis charge, appears from a great number of experiments, by many and high authorities, to be ·57, the actual discharge would be 3,268 cubic feet per minute. The circumstance is to be mentioned, that a certain quantity of air was mingled with the water, over and above that naturally diffused in water, but no estimate can be formed of this quantity, and the discharge may be set down, therefore, as 91·03 tons, raised 20·73 ft. high per minute, or an actual "duty" of 128·1 horse power.

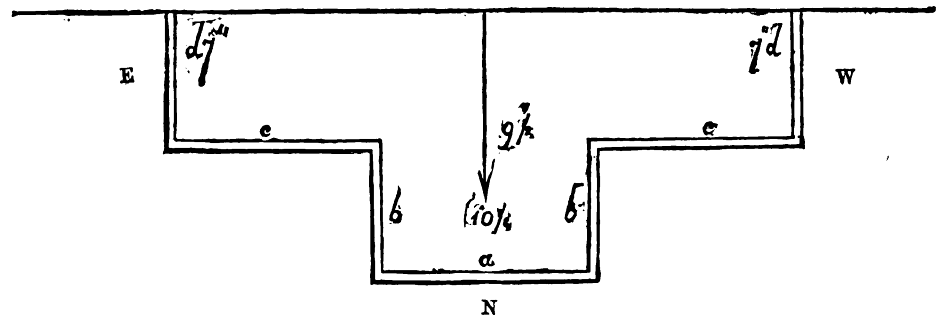
Diagrams, taken at the same time from the engines, showed a mean pressure, exclusive of back pressure, of 26.66 lbs. per square inch. Deducting the ascertained friction of the engines running light, which was 1½ lb. per square inch, and deducting one-seventh of the remaining pressure, as the friction due to the load itself, an estimate made by Pambour, and adopted by Professor Rankine and others, the nett effective pressure usefully exerted in work was 21.56 lb. per square inch, corresponding at 200 revolutions per minute to 154 effective horse power.

Thus the work done by the pump represented 83.18 per cent. of the power actually applied in driving it.

On the 4th and 5th instant, also, in accordance with an understanding between yourselves and Messrs. Easton, Amos, and Sons, I attended to note the working of their engines and centrifugal pump in the western annex. The engines have cylinders nominally bored to 20 (but which are slightly larger), 24 inch stroke, and have a large bevil wheel with 124 teeth on the engine-shaft, which gears into another wheel of 52 teeth on a vertical pump shaft. The diameter of the pump, as given to me by the makers, is 4 ft. 5 in., and the makers, who have had much experience with the working of these pumps, also stated the capacity of their pump in the Exhibition as equal, at 118 revolutions per minute, to a discharge of 100 tons of water per minute on a 6 ft. lift.

The next trials were made to test the absolute efficiency of the pump, both as to the quantity of water raised, and as to the proportion of useful work done to the power applied.

The engines being run at 52 revolutions per minute, corresponding to 124 revolutions of the pump, the total lift of the water was found to be 7 ft. 0⅞ in., or say 7·0833 ft. The rim of the upper tank, over which rim the water was discharged, was of the following shape :—



The total length of the line of overflow, as measured around the inside of the tank, was 42 ft. 1 in.; the northermost inner edge being 6 ft. and ⅛ in. long. The flange forming the edge of tank was 2¼ in. wide all round, and was horizontal on its upper surface. The water entered the upper tank in a horizontal direction, indicated by the arrow on the sketch, and through an opening 5 ft. 10¼ in. wide. The height of the water above the upper edge of the tank, when the pump was making 124 revolutions per minute, was found to be as marked in figures on the sketch—to wit, 9¼ in. in the middle of the larger part of the tank, 10¼ in. in the middle of the fore part, and 7 in. in each of the side bays of the tank. The height of the water over the centre of the pump was 13¼ in. above the edge of the upper tank. The actual thickness of the stream overflowing on the northernmost edge was 8 inches, and on the easternmost and westernmost edges 5¼ in. In calculating the discharge I have, in order to allow for the initial velocity of the water approaching the edge marked *a*, considered the discharge over that edge to be due to the full head over the pump or 13¼ inches. The discharge over the sides *b b* has been calculated, as due to a true head of 10¼ inches, as measured by holding a long straight edge across the tank, and so as to skim the water.

The direction of the current in the tank being parallel to the sides *b b*, the discharge over them would really be somewhat less than that due to the full head of 10¼ in., but I have made no deduction on this account. For the sides *c c* and *d d*, a true head of 7", as obtained by means of the straight edge, is taken. These sides, being out of the line of the current setting through the tank, I have made no allowance for the initial velocity. The true head acting to produce a discharge over the four sides *b b* and *c c* would no doubt be intermediate between 10¼ and 7¼ inches; as for some part of the length of the sides *c c* the head must have been greater than 7 inches. If, however, the mean of these heads, or 8¾ inch, be taken as the true head acting over the four sides *b b* and *c c*, the total calculated discharge would be rather less than that by taking the heads 10¼ inch and 7 inch respectively. With the desire, therefore, of not under-estimating the discharge of a pump, which must be looked upon as a rival of your own, I have adopted the calculation giving the greater discharge, taking a head of 10¼ in. for the whole length of the two sides *b b*, and a head of 7 in. for *c c* and *d d*. The co-efficient of discharge under an equal head, would be considerably less for a weir 2¼ in. wide than for one of ⅜ in., but as there was a less depth of head acting upon Messrs. Easton, Amos, and Son's weir, I have taken the same co-efficient as in estimating the discharge from your pump, viz., 57 per cent. of the full theoretical discharge.

In the case of Messrs. Easton's pump, then, the discharge over the edge *a* was 1319·11 cubic feet per minute, that over the two sides *b b* 1796·31 cubic feet per minute, and that over the four sides *c c* and *d d* 1938·22 cubic feet, making 5053·64 cubic feet per minute for the total discharge. Air was, of course, present in the water, the total body of water falling, and the superficial extent of the falling sheet being much greater than from your pump, although from the low lift the velocity at the end of the fall was probably not more than two-thirds as great as in the case of your pump. As it is impossible to estimate correctly the proportion of air, I merely mention its presence, and allow 62.4 lbs., as in the case of your pump, for each cubic foot of discharge. This gives Messrs. Easton's pump a discharge of 140.77 tons of water per minute, or nearly 41 per cent. more than the makers have claimed for it, and as the lift was 7.0833 ft. instead of 6 ft., the work done was equal to 67.68 horse power, or 63.6 per cent. greater than the makers claim. I cannot quite believe that had the water been discharged into a gauge tank, the quantity actually thrown per minute would have weighed 140.77 tons; but with the wish not to under-estimate, for your guidance, the capabilities of a pump occupying the place of the rival to your own, I have, wherever any doubt has arisen as to the true mode of calculating the discharge, adopted that, giving to Messrs. Easton's pump the highest result.

The power exerted at the same time by Messrs. Easton's engines was ascertained. Diagrams, taken from both the top and bottom of both cylinders, are herewith annexed. The diagrams from the bottom of the cylinders are nearly worthless, however, on account of the length and comparatively small diameter of the pipe through which steam was carried from the bottom of the cylinder to the indicator, the latter being placed at the top of the cylinder, and quite 2½ ft. from the bottom.

The pressure at the top of the cylinder has been taken as the true pressure, the engine man having stated that the slide valves were carefully set to admit steam equally to the top and bottom of the cylinder. The mean effective pressure, therefore, at 52 revolutions, is 29·53 lbs. The indicator made by Messrs. Elliott Brothers, was, I was assured, and have reason to believe, frictionless, so that no deduction is to be made on account of indicator friction. There was no means of ascertaining the friction of the engines; but this must have been somewhat less, as measured in lbs. per square inch of piston, than in the case of your own engines. Messrs. Easton's engines had a stroke and connecting rods of good length, a parallel motion, instead of cross-head guide blocks; the connecting rod, instead of taking on to a crank, of the full diameter of the shaft, as in your engines, grasped a small crank pin; and in Messrs. Easton's engines there was a heavy geared wheel, serving as a fly-wheel, and having a counter weight. It may be, however, that the friction of the bevil gearing was enough to bring the whole friction between the piston and the pump up to that of your engines, and therefore I have estimated for both a pressure of 1½ lbs. as that required to run the engines *per se*, and an additional friction due to the load, as equal to one-seventh of the additional pressure on the pistons over and above 1½ per square inch. This gives a nett pressure of 24 lb. in Messrs. Easton's engines, and 94.44 horse power actually applied to drive the pump. The useful work done being equal to 67·68 horse power, this is 71⅔ per cent. of the power applied, as contrasted with 83.2 per cent. in the case of your pump. As compared with the full theoretical efficiency of 100 per cent., your pump reached 11½ per cent. nearer to this than Messrs. Easton's: and as compared directly with Messrs. Easton's pump, yours did 16 per cent. more work in proportion to the power applied.

Should the estimate of engine friction have been too high, the efficiency of both pumps would be correspondingly less than I have calculated, but your pump would still retain the same relative advantage. The results attained may be recapitulated as follows :—

MESSRS. GWYNNE & CO.'S PUMP.

Diameter of disc, 45".
Revolutions per minute, 200.
Lift, including friction of pipes, 20 ft. 8¾ in.
Water discharged per minute, 3·268 cubic feet.
Water discharged per minute, 91·03 tons.
Equivalent work done, 128·1 horse power.

Nett power applied, 154 horse power.
Useful effect attained, 83·18 per cent.
Velocity of periphery of pump, 41·886 ft. per second.
Height corresponding to this velocity, 27·207 ft.

Messrs. Easton, Amos, & Son's Pump.

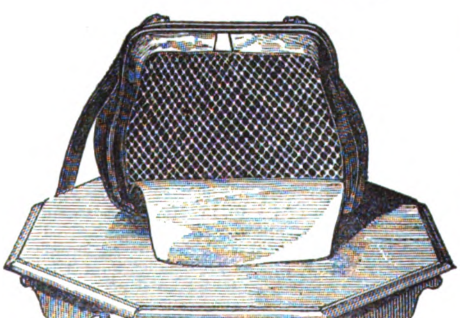
Diameter of disc, 4'5".
Revolutions per minute, 124.
Lift, including friction of pipes, 7 ft. 1 in.
Water discharged per minute, 5053·64 cubic feet.
Water discharged per minute, 140·77 tons.
Equivalent work done, 67·68 horse-power.
Nett power applied, 94·44 horse-power.
Useful effect attained, 71·66 per cent.
Velocity of periphery of pump, 28·675 ft. per second.
Height corresponding to this velocity, 12·725 ft.

I am, Gentlemen,
Your obedient servant,
Zerah Colburn.

SCHÄFER'S PATENT BULLION BAG.

Messrs. Schafer, of Golden-square, whose safety bag-lock we noticed in our pages a short time back, have recently patented a very important invention in bags for carrying papers, bullion, and other valuables. The invention consists in inserting a strong steel gauge or chain work, between the outer leather and the inner lining, so as to prevent the bag being cut, opened, or ripped by any sharp implement. The annexed engravings illustrate the invention fitted to travelling bags, the smaller figure shows a tourist bag, with a portion of the outer leather cut away, to expose the wire

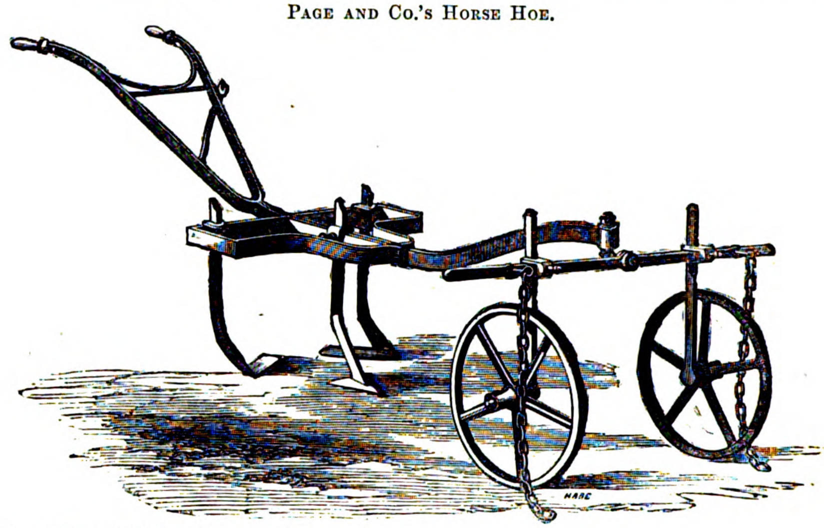
Schafer's Protected Bag.



Schafer's Protected Tourist's Bag.

gauze with which it is lined. The larger figure shows an ordinary travelling bag, fitted with chain work. We understand Messrs. Schäfers are making bags in the form of a sack, suitable for the use of the Post-office and bankers, having a chain-strap or band to fasten the same. It will be seen by the above description, that Messrs. Schäfers can supply the public with a bag which will withstand the curiosity of intruders, and afford security to its contents. We submit this invention to the consideration of merchants and others, having occasion to send valuable papers or articles by rail or other conveyance.

Page and Co.'s Horse Hoe.

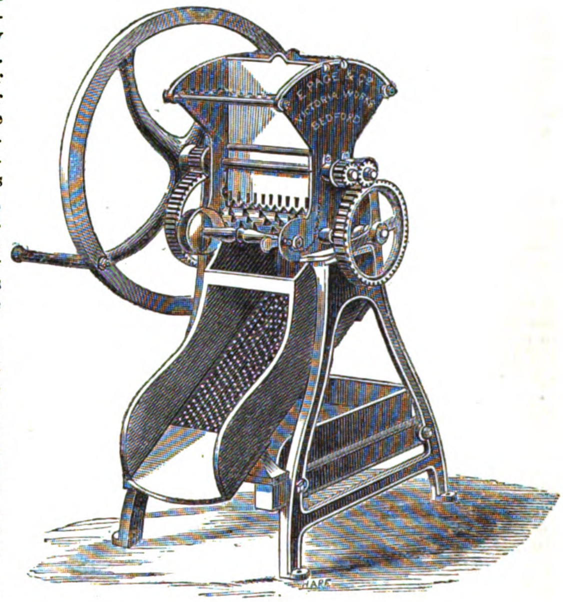


PAGE AND CO.'S OIL CAKE BREAKER AND HORSE HOE.

The annexed engravings show some implements that appeared at the Smithfield Club Show, and exhibited by Messrs. E. Page and Co., of Bedford. The horse hoe is for either ridge or flat, and can be converted into a four row wheat or barley hoe, taking the ridges at 9 inches apart. This implement is entirely of wrought-iron, except the wheels. A universal joint is fitted in the centre of the front bar, upon which the implement can swing. The centre hoe slides along the beam, and the side hoes can be placed farther apart. On hard ground, two grubbers may be placed on the front bars of the frame.

The oil-cake breaker is neatly arranged. The lids in the hopper can be made to fall on each side, so that a capacious box is formed to receive the broken cake when required to be twice ground. The rollers work inside a rack or comb, which prevents adhesion of cake when in a damp state. The rollers are kept parallel by a double eccentric working on each end of the roller. It will break seven different sizes. The whole is on an iron frame, having a screen and strainer for dust, and it can be worked by a boy.

Page and Co.'s Oil Cake Breaker.



INSTITUTION OF ENGINEERS IN SCOTLAND.

First Meeting of Session, 29th Oct., 1862.

Results of an Experimental Inquiry into the Comparative Tensile Strength and other Properties of various kinds of Wrought Iron and Steel.

By Mr. David Kirkaldy.

Mr. Kirkaldy exhibited several cases of the fractured specimens upon which his experiments were made; and, by way of introduction to the discussion, there were read from his Treatise the following conclusions arrived at by Mr. Kirkaldy in the course of his inquiry :—

1. The breaking strain does *not* indicate the quality, as hitherto assumed.

2. A *high* breaking strain may be due to the iron being of superior quality, dense, fine, and moderately soft, or simply to its being very hard and unyielding.

3. A *low* breaking strain may be due to looseness and coarseness in the texture, or to extreme softness, although accompanied by very close and fine quality.

4. The contraction of area at fracture, previously overlooked, forms an essential element in estimating the quality of specimens.

5. The respective merits of various specimens can be correctly ascertained by comparing the breaking strain *jointly* with the contraction of area.

6. Inferior qualities show a much greater *variation* in the breaking strain than superior.

7. Greater differences exist between small and large bars in coarse than in fine varieties.

8. The prevailing opinion of a rough bar being stronger than a turned one is erroneous.

9. Rolled bars are slightly hardened by being forged down.

10. The breaking strain and contraction of area of iron plates are greater in the direction in which they are rolled than in a transverse direction.

11. A very slight difference exists between specimens from the centre and specimens from the outside of crank-shafts.

12. The breaking strain and contraction of area are greater in those specimens cut lengthways out of crank-shafts than in those cut crossways.

13. The breaking strain of steel, when taken alone, gives no clue to the real qualities of various kinds of that metal.

14. The contraction of area at fracture of specimens of steel must be ascertained as well as those of iron.

15. The breaking strain, *jointly* with the contraction of area, affords the means of comparing the peculiarities in various lots of specimens.

16. Some descriptions of steel are found to be very hard, and, consequently, suitable for some purposes; whilst others are extremely soft, and equally suitable for other uses.

17. The breaking strain and contraction of area of *puddled*-steel plates, as in iron plates, are greater in the direction in which they are rolled; whereas in *cast*-steel they are less.

18. Iron, when fractured suddenly, presents in-

variably a crystalline appearance; when fractured slowly, its appearance is invariably fibrous.

19. The appearance may be changed from fibrous to crystalline by merely altering the shape of the specimen so as to render it more liable to snap.

20. The appearance may be changed by varying the treatment so as to render the iron harder and more liable to snap.

21. The appearance may be changed by applying the strain so suddenly as to render the specimen more liable to snap, from having less time to stretch.

22. Iron is less liable to snap the more it is worked and rolled.

23. The "skin" or outer part of the iron is somewhat harder than the inner part, as shown by appearance of fracture in rough and turned bars.

24. The mixed character of the scrap-iron used in large forgings is proved by the singularly varied appearance of the fractures of specimens cut out of crank-shafts.

25. The texture of various kinds of wrought-iron is beautifully developed by immersion in dilute hydrochloric acid, which, acting on the surrounding impurities, exposes the metallic portion alone for examination.

26. In the fibrous fractures the threads are drawn out, and are viewed externally, whilst in the crystalline fractures the threads are snapped across in clusters, and are viewed internally or sectionally. In the latter cases the fracture of the specimen is always at right angles to the length; in the former it is more or less irregular.

27. Steel invariably presents, when fractured slowly, a silky fibrous appearance; when fractured suddenly, the appearance is invariably granular, in which case also the fracture is always at right angles to the length; when the fracture is fibrous, the angle diverges, always more or less from 90 deg.

28. The granular appearance presented by steel suddenly fractured is nearly free of lustre, and unlike the brilliant crystalline appearance of iron suddenly fractured; the two combined in the same specimen are shown in iron bolts partly converted into steel.

29. Steel which previously broke with a silky fibrous appearance is changed into granular by being hardened.

30. The little additional time required in testing those specimens, whose rate of elongation was noted, had no injurious effect in lessening the amount of breaking strain, as imagined by some.

31. The rate of elongation varies, not only extremely in different qualities, but also to a considerable extent in specimens of the same brand.

32. The specimens were generally found to stretch equally throughout their length until close upon rupture, when they, more or less, suddenly drew out, usually at one part only, sometimes at two, and, in a few exceptional cases, at three different places.

33. The ratio of ultimate elongation may be greater in short than in long bars in some description of iron, whilst in others the ratio is not effected by difference in the length.

34. The lateral dimensions of specimens form an important element in comparing either the rate of, or the ultimate, elongations—a circumstance which has been hitherto overlooked.

35. Steel is reduced in strength by being hardened in water, while the strength is vastly increased by its being hardened in oil.

36. The more highly steel is heated (without, of course, running the risk of being burned) the greater is the increase of strength, on its being plunged into oil.

37. In a highly converted or hard steel, the increase in strength and in hardness is greater than in a less converted or soft steel.

38. Heated steel, by being plunged into oil, instead of water, is not only considerably *hardened*, but *toughened* by the treatment.

39. Steel plates, hardened in oil, and joined together with rivets, are fully equal in strength to an unjointed soft plate, or the loss of strength by rivetting is more than counterbalanced by the increase in strength by hardening in oil.

40. Steel rivets, fully larger in diameter than those used in rivetting iron plates of the same thickness, being found to be greatly too small for rivetting steel plates, the probability is suggested that the proper proportion for iron rivets is not, as generally assumed, a diameter equal to the thickness of the two plates to be joined.

41. The shearing strain of steel rivets is found to be about a fourth less than the tensile strain.

42. Iron bolts, case-hardened, bore a less breaking strain than when wholly iron, owing to the superior tenacity of the small proportion of steel being more than counterbalanced by the greater ductility of the remaining portion of iron.

43. Iron highly heated, and suddenly cooled in water, is hardened, and the breaking strain, when gradually applied, increased, but, at the same time, it is rendered more liable to snap.

44. Iron, like steel, is softened, and the breaking strain reduced, by being heated and allowed to cool slowly.

45. Iron, subjected to the cold-rolling process, has its breaking strain greatly increased by being made extremely hard, and not by being "consolidated," as previously supposed.

46. Specimens cut out of a crank ft are improved by additional hammering.

47. The galvanizing, or tinning, of iron plates, produces no sensible effects on plates of the thickness experimented on. The results, however, may be different should the plates be extremely thin.

48. The breaking strain is materially effected by the shape of the specimen. Thus the amount borne was much less when the diameter was uniform for some inches of the length than when confined to a small portion—a peculiarity previously unascertained, and not even suspected.

49. It is necessary to know correctly the exact conditions under which any tests are made, before we can equitably compare results obtained from different quarters.

50. The startling discrepancy between experiments made at the Royal Arsenal, and by the writer, is due to the difference in the shape of the respectiv specimens, and not in the difference in the two testing machines.

51. In screwed bolts, the breaking strain is found to be greater when old dies are used in their formation than when the dies are new, owing to the iron becoming harder by the greater pressure required in forming the screw thread when the dies are old and blunt, than when new and sharp.

52. The strength of screw-bolts is found to be in proportion to their relative areas, there being only a slight difference in favour of the smaller, compared with the larger, sizes, instead of the very material difference previously imagined.

53. Screwed bolts are not necessarily injured, although strained nearly to their breaking point.

54. A greet variation consists in the strength of iron bars which have been cut and welded; whilst some bear almost as much as the uncut bar, the strength of others is reduced fully a third.

55. The welding of steel bars, owing to their being so easily burned by slightly overheating, is a difficult and uncertain operation.

56. Iron is injured by being brought to a white or welding heat, if not at the same time hammered or rolled.

57. The breaking strain is considerably less when the strain is applied suddenly, instead of gradually, though some have imagined that the reverse is the case.

58. The contraction of area is also less when the strain is suddenly applied.

59. The breaking strain is reduced when the iron is frozen; with the strain gradually applied, the difference between a frozen and unfrozen bolt is lessened, as the iron is warmed by the drawing out of the specimen.

60. The amount of heat developed is considerable when the specimen is suddenly stretched, as shown in the formation of vapour from the melting of the layer of ice in one of the specimens, and also by the surface of others assuming tints of various shades of blue and orange, not only in steel, but also, although in a less marked degree, in iron.

61. The specific gravity is found generally to indicate pretty correctly the quality of specimens.

62. The density of iron is *decreased* by the process of wire-drawing, and by the similar process of cold-rolling, instead of *increased*, as previously imagined.

63. The density in some descriptions of iron is also decreased by additional hot-rolling in the ordinary way; in others, the density is very slightly increased.

64. The density of iron is decreased by being drawn out under a tensile strain, instead of increased, as believed by some.

65. The most highly converted steel does not, as some may suppose, possess the greatest density.

66. In cast-steel the density is much greater than in puddled steel, which is even less than in some of the superior descriptions of wrought-iron.

The breaking strain per square inch of wrought-iron is generally stated to be about 25 tons for bars and 20 tons for plates. This corresponds very nearly with the results of the writer's experiments, of which the following table presents a condensed summary:—

	Lbs. Highest.	Lbs. Lowest.	Lbs. Mean.	Tons.
188 Bars, rolled,	68,818	44,584	57,555	— 25¾
72 Angle-iron, &c.,	63,715	37,909	54,729	— 24½
167 Plates, lengthways	62,544	37,474	50,737	— 21¾
160 Plates, crossways,	60,756	32,450	46,171	

Although the *breaking* strain is generally assumed to be about 25 tons for bars and 20 tons for plates, very great difference of opinion exists as to the amount of *working* strain, or the load which can with safety be applied in actual practice. The latter is variously stated at from a third to a tenth. It will be observed that whilst much discussion has arisen as to the amount of working strain, or the ratio the load should bear to the breaking strain, the important circumstance of the *quality* of the iron, as influencing the working strain, or the ratio the load should bear to the breaking strain, the important circumstance of the *quality* of the iron, as influencing the working strain, has been overlooked. The Board of Trade limits the strain to five tons, or 11,200 lbs. per square inch.

It must be abundantly evident, from the facts which have been produced, that the breaking strain, when taken alone, gives a false impression of, instead of indicating, the real quality of the iron, as the experiments which have been instituted reveal the somewhat startling fact, that frequently the inferior kinds of iron actually yield a higher result than the superior. The reason of this difference was shown to be due to the fact, that whilst the one quality retained its original area, only very slightly decreased by the strain, the other was reduced to less than one-half. Now, surely this variation, hitherto unaccountably completely overlooked, is of importance, as indicating the relative hardness or softness of the material, and thus, it is submitted, forms an essential element in considering the safe load that can be practically applied in various structures. It must be borne in mind that although the softness of the material has the effect of lessening the amount of the *breaking* strain, it has the very opposite effect as regards the *working* strain. This holds good for two reasons: first, the softer the iron the less liable it is to snap; and, second, fine or soft iron, being more uniform in quality, can be more depended upon in practice. Hence the load which this description of iron can suspend with safety may approach much more nearly the limit of its breaking strain than can be attempted with the harder or coarser sorts, where a great margin must necessarily be left.

Special attention is now solicited to the practical use that may be made of the new mode of comparison introduced by the writer, viz.: *the breaking strain per squrre inch of the* FRACTURED *area of the specimen, instead of the breaking strain per square inch of the* ORIGINAL *area.*

As a necessary corollary to what he has just endeavoured to establish, the writer now submits, in addition, that the *working* strain should be in proportion to the breaking strain per square inch of fractured area, and not to the breaking strain per square inch of original area, as heretofore. He does not presume to say what that ratio should be, but he fully maintains that some kinds of iron experimented on by him will sustain with safety more than double the load that others can suspend, especially in circumstances where the load is unsteady, and the structure exposed to concussions, as in a ship, or to vibratory action, as in a railway bridge.

The writer has not attempted to explain the cause of the mysterious change produced on steel by heating it and plunging it into water, or the no less singular result effected by plunging it, when heated, into oil. Neither has he tried to account for the mysterious change produced by subjecting iron to the processes of cold-rolling or wire-drawing. The explanation offered by some, of this difficult question, that the iron or steel are *condensed* by the processes to which they are subjected, is completely contradicted by fact, the metal being actually *expanded*. The aim of the writer being strictly to ascertain facts, and state the conclusions which he considers to be fairly deducible from them, he has not felt himself warranted in attempting to speculate on a subject respecting which so little is yet known.

In conclusion, the writer ventures only to express a hope that the experiments, on which he has been so long and unremittingly engaged, may not prove wholly unserviceable to practical science and the world at large. The importance of possessing a thorough knowledge of the capabilities and strength of substances on which the lives and property of so many human beings depend, no one will attempt

to deny. The only excuse, if, indeed, excuse it can be called, for employing an inferior description of material in the rearing of structures on the stability of which such momentous issues are involved, is ignorance or misapprehension of its proper quality. The writer has endeavoured, by a plain statement of facts, to furnish some information on a subject which seems, until now, to have been denied the attention which its paramount importance demands. Were this question fairly taken up and considered, some security might be afforded against the repetition, in future, of disasters occasioned by its being so often practically ignored. The necessity of using nothing but the very best description of metal, where human life or valuable property is at stake, may, he trusts, come soon to be more generally recognized than it is at present. And an increased demand for the finer varieties may conduce to a generous emulation amongst the manufacturers to improve still further the quality of their productions. Should his labours tend in any way, even the smallest degree, to diminish the annual sacrifice of life and property occasioned by faulty material and workmanship, he will feel the satisfaction that they have, at least, not been entirely in vain.

Mr. Kirkaldy exhibited 490 selected specimens, which were contained in five cases, namely:—

In Case I. 9 iron bars, showing elongation and lateral contraction.
1 iron plate, ditto.
1 steel plate, ditto.

In Case II. 42 steel bars, showing fractures and contraction of area.
105 iron bars, ditto.

In Case III. 36 steel plates, ditto.
60 iron plates, ditto.
24 angle-iron, &c., ditto.

In Class IV. 36 iron bars, showing fractures and effects of difference of shape.
40 iron bars, showing fractures and effects of difference of treatment.
12 steel bars, ditto.
10 iron plates, ditto.
15 iron bars, showing fractures and effects of strains suddenly and gradually applied.

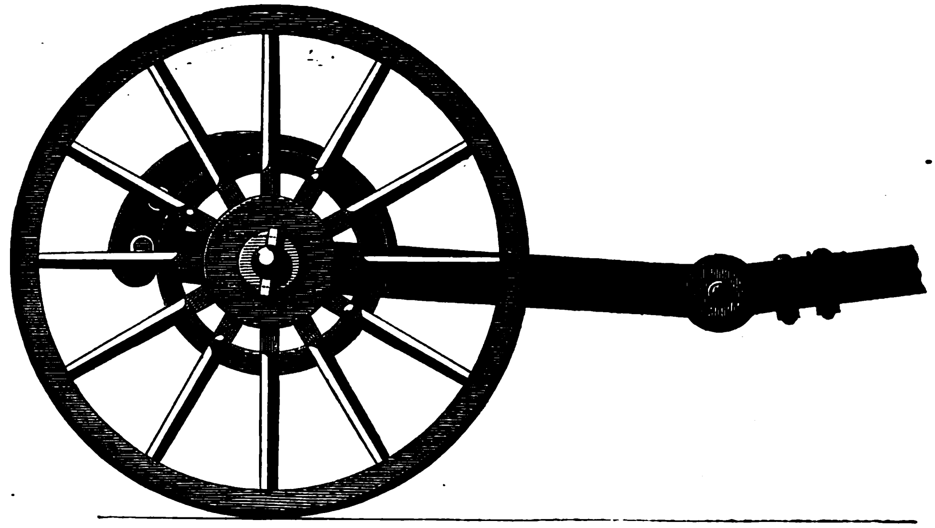
In Case V. 46 iron bars, showing fractures of screwed bolts.
12 iron bars, showing fractures of welded joints.
2 steel bars, ditto.
26 iron bars, showing texture as developed by acid.
8 iron plates, ditto.
1 iron plate, with surface cold-rolled.
4 iron bars, with surface cold-rolled.

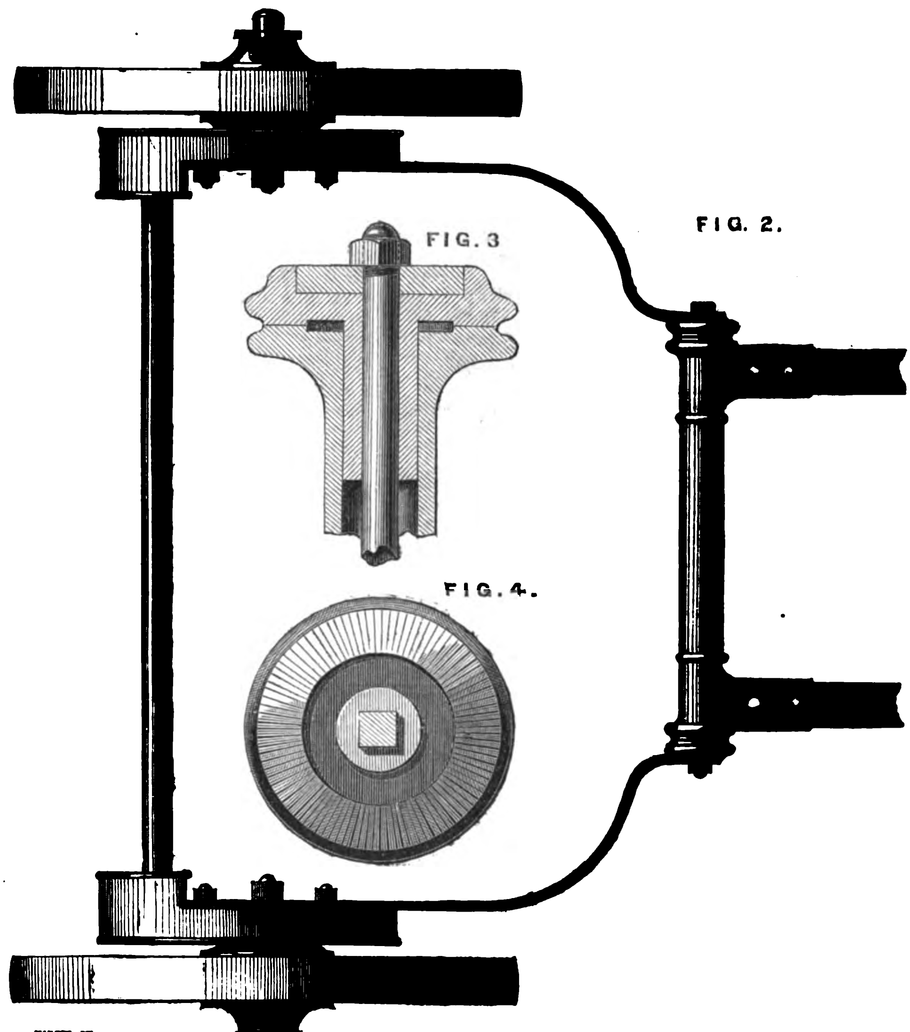
The discussion that ensued on the above will be given next week.

BOBY'S HAYMAKER.

BOBY'S HAYMAKER.

Fig 1.





The accompanying cuts illustrate the new haymaking machine of Mr. Boby. The several parts of this implement are so arranged that they will operate in either direction. To this end the tines are made straight, instead of curved, as usual, so that in whichever direction the rotating frame may be driven, the teeth will act on the hay. The reverse action of the rotating frame is obtained by means of double pinions, which are capable of sliding along their shaft, so that they may be put in gear with the driving cog wheel affixed to the spokes of the travelling wheels of the machine when required. The tines of the implement may be supported in a raised position, nearer to or further from the ground, by the aid of a disc adjustment, which is adapted to the front bar of the machine. The shafts are adapted to a hollow front bar which carries part of the disc adjustment, and they are, therefore, capable of being turned upon a central point, which will admit of the travelling wheels being lifted off the ground, so that they may be taken off their axles without inconvenience. The fork heads that carry the teeth project beyond the circumference of the running wheels, and, therefore, when the fork heads are lowered, they will form a fulcrum on which the machine will rest, when the wheels are to be lifted off the ground.

In the engravings, Fig. 2 represents a plan of the principal parts of this haymaking machine. Fig. 1 is a side elevation of the same; the travelling wheels turn upon stud axles fixed to the side frames of the machine, and the axle of the revolving fork-head cylinder rotates in bearings secured on the ends of the side arms, in the usual manner. If it be desired to cause the cylinder to rotate in either direction, the tines must be made straight, as before mentioned, instead of curved, as is usually the case. As the straight tines are secured to the rotating fork cylinder in the usual manner, this attachment is not shown. The front hollow shaft bar, to which the shafts are secured, carries at each end the discs. A straight rod, seen best in the detached Figs. 3 and 4, passes through the hollow front shaft, and also through the discs, which are secured to the wrought-iron side bars of the framing. The rod is provided at one end with a head, and is screwed at the other end, and carries a nut; so that, by turning or screwing up the nut, the surfaces of the discs may be brought into close contact, and thereby form a friction clutch,

BUNNETT'S PATENT REVOLVING SHUTTERS.

FIG. 1.

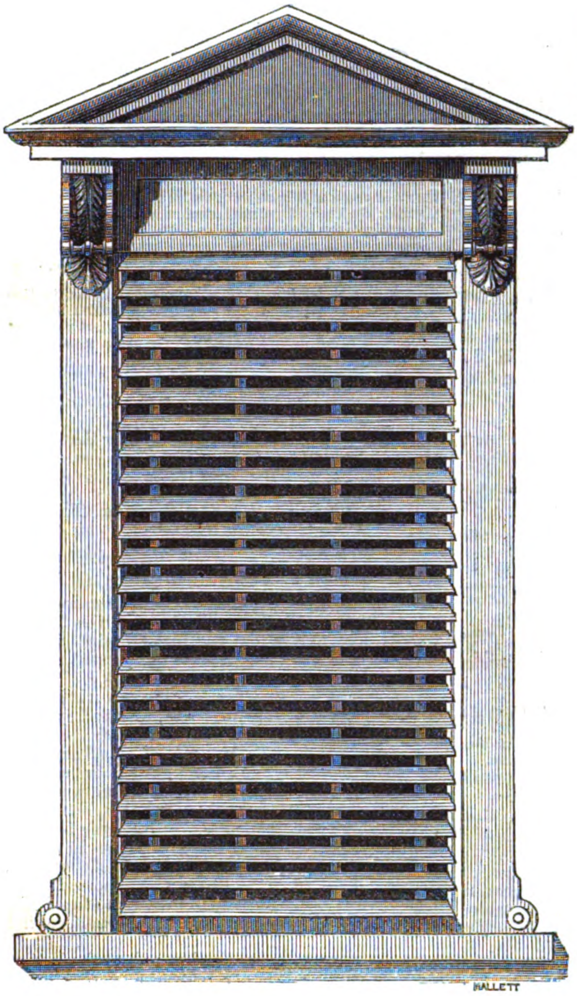


FIG. 2.

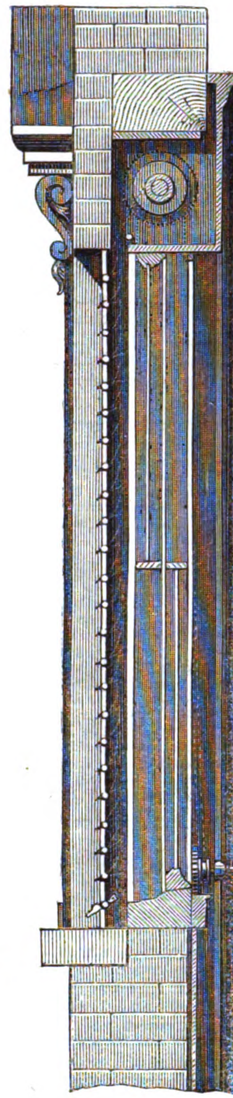


FIG. 3.

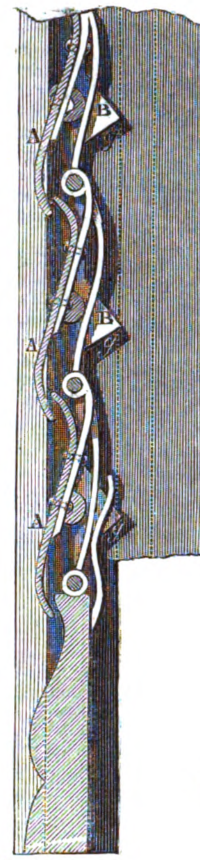


FIG. 4.

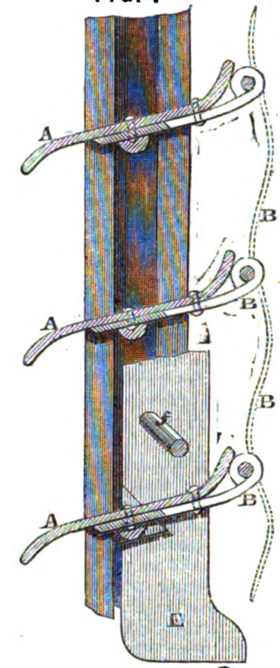


FIG. 5.

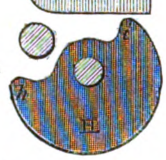
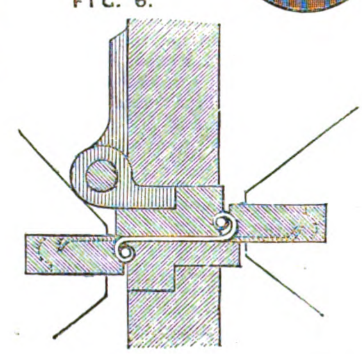


FIG. 6.



which will hold the parts together in any desired position. It will thus be understood that side frames and shafts may be turned upon the axis of the rod as a centre of motion, when the nut is loosened. The relative position of these parts will be thereby changed, and they may be secured in their new position by simply screwing up the discs tightly together.

BUNNETT'S PATENT REVOLVING SHUTTERS.

A VARIETY of improvements have taken place during the last few years in window shutters, and one of the inventions, which we illustrate this week, is an improved shutter, recently patented by Mr. J. Bunnett, of Deptford. The invention consists in so shaping and connecting the plates or louvre boards as to enable them to be placed at any angle, similar to venetian blinds, to admit light into any building to which they may be placed. For this purpose each lath is mounted on a central axis, which moves up and down in the guiding shutter grooves; the upper edges of the laths are connected together by hinged flaps. A portion of the inner side of each shutter groove turns on pivots, and when it is desired to use the shutter as a venetian blind, this limb of the groove is turned a quarter round, when the laths are free to turn on their axes, and may be set at any required inclination.

Fig. 1 of the accompanying engravings is a front elevation of a shutter so constructed. Fig. 2, a side section of the same; Figs. 3 and 4 are sectional views on a larger scale; one showing the plates open, the other showing them closed.

A, A, are the laths, each of which has a projecting central axis at each end; B, B are flat hinges, jointed at their upper ends to the shutter roller, and also to the upper parts of each of the laths. The axes of the laths slide up and down in grooves at the sides of the window. Attached to the lower end of a moveable limb there is an inclined rising step or quadrant, upon which the foot of the vertical bar E rests, its fore edge laying flush with the back of the groove. When the shutter is to be used as a venetian blind, it is lowered, and the limb turned round a quarter of a revolution, when the bar E will be lifted by the rising step, and, by means of guide pins working in the inclined slots *f*, the bar will be thrown forward, when the notches *g*, in the front edge of the bar, come in contact with and form bearings for the axes of the laths, which may then be set at any required angle by means of a handle attached to the lower bar or rail of the shutter. When the shutter is to be closed, the limb is turned back into its original position; the bar E then falls back into its place, flush with the back face of the groove. Fig. 5 shows another mode of actuating the bar E; in lieu of the rising step before described, a cam H is placed at the lower part of the groove. When the shutter is lowered, the axes of the lowermost lath *a* comes down upon and by its weight depresses the point *h* of the cam, which causes the opposite point *i* to rise and lift the bar E upward and forward; the lathes may then be opened as required. On beginning to wind up the shutter, the cam H and the bar E fall back into their original positions. The curvature and shape of the plates or louvre boards are effected by suitable machinery, so that both edges of the laths are bent simultaneously. Fig 6 shows the action of the dies. The dotted lines show the form of the lath after the first preliminary bending, in which state it is fed into the finishing part of the machine. In this figure it will be seen that the upper die is hinged to the hold down, for the purpose of enabling it to leave the finished lath without injury. As the revolution of the cranks causes the die blocks to recede, the finished lath falls out. By regulating the distances of the dies, any required amount of curvature may be given to the edges of the lath from a portion to the whole of a circle.

Orders have been received for the construction of another target at Shoeburyness, much larger and stronger than any one that has been experimented upon. It is to be constructed of plates varying from 5½ to 6½ and 7 in. thick. The object of the target, and the experiments upon it, is to discover the maximum thickness of armour plates which cannot be penetrated with Armstrong or Whitworth guns as at present constructed.

NEW WATER GAUGE FOR STEAM BOILERS.

At a recent meeting of the North of England Institute of Mining Engineers—Nicholas Wood, Esq., president, in the chair—a discussion took place upon a paper read by Mr. S. C. Crone, of Killingworth, on Steam Boiler Explosions. In the course of the debate, in reply to the President, Mr. T. Y. Hall mentioned a plan that he had had in use in 1857, and described it to the meeting. His attention had been called to the matter by the conflicting evidence in the celebrated trial in Wales, viz., the Queen *v.* the Dowlais Iron Company, more commonly known as "the battle of the boiler gauges." In an ordinary boiler, he caused a narrow aperture to be made at the end, extending about 5 in. above and below the ordinary level of the water inside. In front of this aperture he placed a strong metal box, into which he fitted a piece of plate glass, and protected it by talc, so that the engineman could see the height of water at any time with perfect safety, and without any risk of failure, such as often happened with cocks, floats, and tubes. He adapted it so that glass could also be fitted in the sides of the projection, and, by placing a light on one side, the water could be seen at all hours of the night. A revolving valve was so placed as to be turned half-way round, to cut off the water and steam whenever it was necessary to clean the glass, or for any other purpose. This plan was applied to a boiler on the premises of Mr. H. Watson, High Bridge Foundry, Newcastle, in 1857, and found to answer admirably. It was also tested without the aperture, cocks and taps alone forming the channel of communication with the water inside the boiler and the talc-protected chamber. He (Mr. Hall) obtained provisional protection for his plan in 1857, but did not persevere with the patent, although he considered that the plan was preferable to any other in existence; and he remained of the same opinion.—The President: Would not the aperture weaken the boiler?—Mr. Hall replied in the negative. The apparatus, being screwed on to the boiler, actually strengthened instead of weakening it (?) The boiler end, instead of having an aperture of ½ in. by 10 in., might be perforated with holes of ½ in. diameter, 1 in. apart, which would answer the same purpose, and would be still stronger. In his experiments he had the glass intentionally cracked, but the talc lining still prevented the escape of steam and water, and showed the height of the latter with great distinctness. A Mr. Chandler, of Mark-lane, London, had recently patented a somewhat similar invention; but in Mr. Chandler's plan there was no protection to the glass, and it necessitated the use of two cocks. When it was required, his (Mr. Hall's) apparatus could be extended through brickwork any distance from the boiler, so as to do away with floats, cocks, and the small round tubes, and enable the engineman to see the state of the water-level in the boiler, without any such intervention as has heretofore been applied. A float, made of cork, india rubber, or some other elastic substance, might be put in at the top of the apparatus by a small rod, but he did not consider it necessary. It might, however, be used at any time as a rubber, to take the steam off the inside of the talc.

PATENTS.

The Birmingham Chamber of Commerce has lately received a communication from the Patent Law Commissioners, containing the following questions:—1. Should the cost of obtaining letters patent be diminished or increased; if either, to what extent; and should the payments be made in one sum, or by annual or other instalments? 2. Does the present mode of obtaining patents appear to you satisfactory? Is it your opinion that there ought to be a preliminary investigation of a more searching character than that which at present takes place? If so, how should the tribunal be constituted before which such investigation shall be conducted, and should the judgment of such tribunal be final? 3. Should the investigation be *ex parte* or public, and subject to opposition? Should the present practice as to caveats be adhered to? 4. Do you consider that patents ought to be refused on the ground of the trifling and frivolous nature of the inventions for which they are claimed? 5. Should greater facilities be provided for the repeal of invalid patents? 6. Do you consider that any change should be made in the tribunal appointed to try actions and suits instituted by patentees? 7. Should the granting of licenses, in your opinion, be made compulsory, and can you suggest any practicable method by which this should be done? 8. Have you any reason to suppose that public inconvenience is caused by the multiplicity of patents? 9. Do you think it expedient that patents should be granted to foreigners residing abroad, or to their nominees? 10. Is it expedient to make any, and if so, what alterations in the law relating to prolongations and confirmations? 11. Is it expedient to make any, and if so, what alterations in the law respecting disclaimers and memoranda of alterations?

Meetings for the Week.

Mon.—*London Inst.*, "On the House of Commons, Horace Walpole, and Modern Satire," by Shirley Brooks, Esq., at 7 p.m.

Tues.—*Royal Inst.*, "On Air and Water" (juvenile lecture), by Professor Frankland, at 3 p.m.

Wed.—*Geological Soc.*, 1, "On the Lower Carboniferous Brachiopoda of Nova Scotia," by T. Davidson, Esq. 2, "On the Gravel Deposits of Ludlow, Hereford, and Skipton," by T. Curley, Esq. 3, "On the Northerly Extension of the Upper Silurian Passage Beds to Lincley Salop," by G. E. Roberts, Esq. 4, "On some Crustacean Tracks from the Old Red Sandstone near Ludlow," by G. E. Roberts, Esq., at 8 p.m.

Thur.—*Royal Inst.*, "On Air and Water" (juvenile lecture), by Professor Frankland, at 3 p.m.

Fri. — *London Inst.*, "On the Chemistry of the Non-Metalic Elements," by F. Field, Esq., at 7 p.m.

Sat. — *Royal Inst.*, "On Air and Water" (juvenile lecture), by Professor Frankland, at 3 p.m.

Legal Intelligence.

Court of Common Pleas, Dec. 17.—Spencer *v.* Jack and Rollo.—Mr. Lush, Q.C., Mr. Streeton, and Mr. T. Webster, appeared for the plaintiff; Mr. Bovill, Q.C., Mr. Hindmarch, Q.C., and Mr. T. Jones, for the defendants. This case, which had occupied the court for three days, was brought to a conclusion. It was an action brought on behalf of a consulting engineer, of Newcastle-upon-Tyne, against the defendants, engine makers, of Liverpool, for the infringement of a patent taken out by the plaintiff in 1860 for certain improvements in marine steam engines. The claim of the plaintiff under his patent was twofold:—First, in the arrangement of inverted direct-acting screw engines, a disposition of surface condensers, by which the external casing thereof forms part of the main framing, and is placed between and under the cylinders of such engines, and the tubes whereof, being horizontal or slightly inclined, are placed across the line of the keel or propeller shaft; secondly, in the arrangement of paddle-wheel engines, a disposition of surface condensers, by which the external casing thereof is placed between the cylinders, and may or may not form part of the main framing of such engine. The tubes whereof of such condensers, being horizontal or slightly inclined, are placed across the line of paddle-shaft and in line with the keel. The defendants denied the novelty of the invention; but, after a short deliberation, the jury found for the plaintiff as regarded both claims.

The Government steam-ram, "Hector," built by R. Napier and Sons, Govan, is berthed in the Victoria Harbour, Greenock, where she is to receive her machinery and boilers, and otherwise fitted for sea. Her draught of water is now about 21 ft. The dimensions of the "Hector" are 286 ft. long, 56 ft. broad, and 38 ft. deep, her tonnage being 4,063. She will be propelled by a pair of horizontal engines of 800-horse power, prepared by the builders, and fitted with a screw. Her masts and bowsprit will be iron, and the latter will be constructed so as to double up when necessary. The cost of her hull alone will be over £170,000. The "Hector" will carry twenty-four 68-pounders, and six 110-pounders on the main-deck, with a 110-pounder pivot-gun on the upper deck at the stem and stern. Her iron-plating, of 4½ in. thick, will extend to a depth of 5 ft. below the water line.

TO CORRESPONDENTS.

Received.—W. A., J. D. and Sons, J. H., John Goucher (next week), J. C. and Co., J. W., W. R.

J. Garland (Ashton-under-Lyne).—Thanks. Of course the area of a piston cannot be increased by corrugating its surface. *Heating* surface can be increased in this way. The patent you refer to is a scientific absurdity. A shilling book on mechanics would have saved the patentee his £30.

Tyro—The formula you require is $(1-e)\,Vg$, wherein e is specific weight of the body, V the volume of the body immersed, and g the known pressure of the water for any given depth. Of course the total lift is taken as acting on the centre of gravity.

Iron.—As you will have seen, we published your letter last week. We know at present of no work or really *scientific* investigations into the subject. You will see by the accounts of the trials in our paper that it is not a *purely* mechanical question. Other forces come into play.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of his good faith.

Correspondence.

[*We do not hold ourselves responsible for the opinions of our Correspondents.*]

WHEEL TRAFFIC THROUGH THE THAMES TUNNEL.

[We insert the following as a curiosity.]

TO THE EDITOR OF THE "MECHANICS' MAGAZINE."

Sir,—Having submitted to the Directors a plan for conveying wheel traffic through the Thames Tunnel, I thought a few particulars might interest some of your readers. Within the present shafts I propose to construct—

1, A cylindrical iron frame-work the whole depth of the shaft, formed, at intervals, of small cylinders to hold wooden sleepers.

2, Attached to the inner side of this frame-work are three lines of spiral railway, one above another.

3, Also, within the cylindrical frame-work, two circular platforms, of nearly equal area, one resting on the other—the upper platform to carry the load, viz., waggons, horses, &c.; this is free to subside or rise, but cannot revolve, being held by guide-frames. The lower platform is supported on 18 wheels, in tiers, to correspond with the three lines of rail. This lower platform has a cruciform hole in the centre.

As the rails coil round and round to the bottom, the weight on the upper platform bearing on the lower, both will descend till they reach the bottom, where a doorway is provided for the exit of the carriages.

4, In the centre of the iron cylinder is a vertical spindle, turning on a point at the bottom of the shaft. It is of cruciform shape, formed of timbers, to give it rigidity, and it passes through a corresponding hole, as before-mentioned, in the lower platform.

5, Over each shaft is an hydraulic engine, with three cylinders, working into a vertical shaft, and this is connected with the before-mentioned spindle by a peculiar clutch. It will be seen that the hydraulic engine gives motion to the vertical spindle, which conveys that motion to the lower platform by passing through the hole in the centre. By this means, without a single cog-wheel, it is in gear with the engine at all altitudes.

6, Means of storing up the surplus labour performed by the descending load.

If the motion of the engine can raise the platform, the latter, in descending, could move the engine by a suitable arrangement of the valves, provided the pressure on the pistons be low enough. I therefore propose *two* auxiliary accumulators, of different pressures. If the steam engine that supplies the great accumulator draws the water from the two auxiliaries, the labour of forcing will only equal the difference of pressure—thus, the labour will be economized.

I am, &c.,
George White.

Clarkson's Endowed School, Mansfield, Notts,
December 2, 1862.

THE PERSIAN GULF CABLE.

Sir,—Will you permit me to make a few observations respecting the general construction of the Persian Gulf cable now in process of manufacture. I think the particulars of important lines of cable cannot be made too public, in order, by degrees, to familiarize all who are concerned in such matters with every important item concerning them, espe-

cially of their construction, since such information will eventually enable them to compare, and judge, and form opinions more or less approximatively to correctness in proportion as they bring to bear upon the subject, and their reasoning and discerning faculties divested of indifference, pre-conceived notions, and untenable prejudices.

First, then, the cable in question has a conductor of one solid copper wire, 1-10th of an inch in diameter. Now, it is for us to examine the wisdom of this choice of conductor, which certainly savours of retrogression rather than advancement. This was the style of conductor first adopted in submarine and subterranean cables, but was subsequently abandoned, because if by any accident it should become broken, as was not unfrequently the case, the cable was rendered useless, since continuity was interrupted, and there was no help for it but to haul up the cable in order to make the necessary join: hence a strand of 7 wires, whose total diameters should equal the area of one large solid conductor, was invariably adopted as far preferable to the latter, since, if a break occur, which is seldom the case, it would only be of *one* wire, leaving the other six intact and perfect, and so not interfering with the continuity; but even this contingency is rendered extremely improbable by the recent improvements in making stranded copper wire joints. The result of this discovery was the universal adoption of stranded conductors, and it was and is generally considered an important step in advance of the original style; so much so, indeed, that the Government Committee thought proper to strongly recommend stranded conductors as the most efficient according to their notions of what a good conductor should be. There was only one objection that could be urged against them—an objection more fanciful than real, viz.: the interstices that would exist, and which it was supposed that no method of insulation, of whatever material, would perfectly fill up. But it is manifest, that if gutta-percha be the insulator, that the very fact of its being put in by a die process, and in a pulpy state, is quite sufficient to effectually prevent the existence of any interstice that could act prejudicially by the admission of water and air. And although india-rubber must be applied by a different method, it is equally clear to those practically acquainted with the matter, that this objection has no foundation, in fact; and if it had, the means of preventing it by the application of caoutchouc thread are perfect. Of course, a conductor of one solid wire is most likely to give way at the joints; these places in a single wire being necessarily weaker than any other point, or if not weaker, certainly not capable of bearing so much strain, because the nature of the join is such as to render the metal harsh and brittle, and thus even a bend at too acute an angle might cause the conductor to sever at the joint.

It may be urged that no strain should fall upon the conductor; but this belongs to the order of things which ought not to be. We are dealing with things as they are. It is notorious that strain does fall upon the conductor, and ever will so long as we adhere to ponderous cables of spiral iron wire, for these cables are necessarily of such immense weight as to elongate considerably when suspended to any great stretch in submersion; hence, the core being the only longitudinal portion of the cable, is the only portion that is called upon to bear the accumulated mass of its lumbering protector; and when you consider for a moment the breaking strain of any given size of copper wire, it is not difficult to divine the consequences. From whatever point of view this matter is observed, it must appear evident that stranded conductors are the more perfect, efficient, and, in every sense of the word, suitable for submarine cables, and that the departure from, or setting at nought of, advanced experience on this head augurs but indifferently for the future of this cable, which certainly should be in every respect more perfect than any heretofore submerged.

I will, secondly, briefly refer to the insulation of this cable, which consists of alternate layers of gutta-percha and Chatterton's compound, the latter, of course, being but an admixture of the former with other materials; and, although superior in some respects, yet taken as a whole it were safer to insulate with percha only. The choice thus made for insulation, I need scarcely say, has surprised every one, not excepting those immediately interested in the manufacture of gutta-percha, for, like candid and honest men, they are free to admit the feasibility of the objection urged to its use in warm climates. As is the conductor, so is the insulation, a departure from acquired experience, denoting an inexcusable retrograde step, which all previous enterprises in this direction but too well confirm. With the fate of sundry other cables before our eyes, one may *wish* that this may be a success, but scarcely dare hope that it will rank any higher than the Rangoon, or the Red Sea cables. In addition to the utter inability of percha to withstand high temperatures, it is also of too non-elastic a nature to bear the strain which will be thrown upon it by the means above referred to, without serious injury. And thus this material, which is a really good insulator in ordinary circumstances, is not unfrequently made to bear the ill-repute which is justly due to the irrational construction of the outer sheathing, and hence, if it had a tongue, it might cry out, "Save me from my friends." The force of opinion insisted on caoutchouc insulation in this case, but it has been disregarded, and it may well be asked in whom are we to put our trust for the successful working out of this problem of ocean telegraphy, since the results of progressive experience are ignored?

3rdly. As to the outer covering. This matter has been also ably treated by certain of your correspondents, in every way capable of forming correct opinions, as to leave me nothing to say on this head, save a few remarks, which must also be in the same censuring strain as the preceding. The cable, of course, is to be sheathed with iron wire, in the usual way, and will consist of 12 No. 7 gauge for that part which is to be submerged in deep water, after which there are to be repeated coverings of the whole, in order to protect the iron from rusting too speedily, consisting alternately of a serving of mineral pitch, silica, and Stockholm tar, and yarn, the former mixture to be put on boiling hot, rather a risky process, one would imagine, to so susceptible a material as the gutta percha, which lies immediately beneath. This additional protection of a protector, by the way, is a patented process of Mr. Latimer Clark.

It will thus be seen that the Persian Gulf cable, when completed, will weigh not far short of 4 tons per nautical mile, if indeed, it do not exceed that weight. This fact speaks for itself, I need say no more. We shall be more surprised at its success than its non-success. Think of four tons per nautical mile, and the amount of elongation that will ensue, risking the disjunctibility of the core, and the strain to breaking point on the conductor, and having the fate of other cables before our eyes, how can we be at all sanguine of the success of this one, or refrain from condemning the manufacture of cables upon such principles that must inevitably tend to ruinous failure and expense, and no less tend to the retardation of submarine telegraphic success. PHILO.

Gossip.

We regret that we have to record the death of Mr. Weale, of High Holborn, which took place on the 18th inst. Mr. Weale was a most enterprising publisher, and the valuable works that issued from his establishment have materially contributed to the progress of science and art in England. He risked £50,000 on his "Rudimentary series" alone. He expended, at his own risk, £209,502 on his publications, and £29,695 at the risk of authors.

The *Prairie Farmer* says that we are in a fair way to obtain from sorghum a valuable material for the manufacture of paper. A paper mill on the Fox river, Ill., is already using considerable quantities of it in the manufacture of wrapping paper, and is putting in the necessary machinery for preparing it for printing paper. When completed, it will use from two to three tons of sorghum per day.

Admiralty orders have been received at Chatham Dockyard, directing that steam-vessels of war of every description, with the exception of gunboats, are to be fitted with engine-room telegraphs.

The *Moniteur de l'Armee* publishes a regulation emanating from the Ministry of War, relative to the prevention of accidents by fire. The use of the ordinary chemical matches is interdicted in barracks and other military establishments. The "Allumettes hygieniques armophes" are alone authorized. Soldiers, or other persons employed in the above places, who infringe this regulation, will be severely punished.

The Government have selected the tender of Mr. Henley, the sub-marine contractor, of North Woolwich, for the manufacture of the Persian Gulf telegraph cable, which is to be 875 nautical miles in length.

It is said that a plan has just been tried on the Northern Railway of France for receiving the letter bags at intermediate stations without stopping the train. By means of a ring the bag is attached to a post on the line; the engine is provided with a rod, so disposed as to catch the ring, and thus carry off the letters. By a similar contrivance, bags are left by the train when necessary.

An experiment, says the Paris correspondent of the *Times*, was made a few days since at Nancy with a new propeller on a temporary railway constructed with rails lent by the directors of the Paris and Strasburg Railway Company. Several persons of distinction, and many others interested in railway concerns, were present. As the inventor asserts that his propellor is capable of exerting the greatest force, and of propelling railway carriages at the greatest speed, the question of force alone was the subject of the late experiment. As the road was prepared so as to present the greatest difficulties, such as an ascent of three centimetres the metre and two successive curves of a radius of 60 ft., it would have been dangerous to proceed at a greater speed than that of an ordinary French train (about 35 miles an hour). It is further to be remarked that the rails lent by the Strasburg company were not in a very good state. The ends of the rails were so uneven that even at the moderate speed at which it was driven the waggon was much jolted. The success of the experiment was complete as to the regularity of the action of the propeller. It was admitted by all present that the motion was uniform and without any sudden shock.

The same newspapers that describe a visit of the Emperor of France to Baron James de Rothschild, state that the Bavarian Government has refused to ratify the election of a Jew to an academic chair.

We read in a Copenhagen letter:—The Royal Artillery, some days ago, made experiments with gunpowder made of paper, which turned out a success. Common packing paper was, in the course of 10 or 15 minutes, transformed into a very powerful kind of gunpowder, and a number of different shots were fired with it. The invention, which seems to be very interesting, belongs to a foreigner.

According to "My Diary, North and South," by Mr. Russell, of *The Times*: in the Washington Navy-yard, this gentleman had the advantage of a colloquy with Captain Dahlgren, who contrived to show him such good practice with shrapnel, and to fire so rapidly, as to keep three shells in the air at the same time.

MINERAL TRAFFIC ON RAILWAYS.—The total quantity of minerals carried on railways in the United Kingdom last year amounted to 63,604,434 tons. Of this vast total, the London and North Western carried 5,381,326 tons; the North Eastern, 6,979,524 tons; the Caledonian, 3,506,672 tons; the Midland, 4,129,910 tons; the Great Eastern, 709,986 tons; the Great Northern, 1,498,654 tons; the Lancashire and Yorkshire, 2,655,498 tons; the Manchester, Sheffield, and Lincolnshire, 611,261 tons; the Great Western, 2,441,118 tons; the Blyth and Tyne, 1,562,068 tons; the Furness, 676,863 tons; the Londonderry, 666,250 tons; the Monmouthshire, 1,603,274 tons; the Newcastle and Carlisle, 627,877 tons; the North Staffordshire, 625,959 tons; the Rhymney, 1,253,891 tons; the St. Helen's, 870,058 tons; the South Wales, 1,455,847 tons; the South Yorkshire, 1,016,639 tons; the Stockton and Darlington, 3,706,144 tons; the Taff Vale, 2,574,446 tons; the Vale of Neath, 776,765 tons; the West Hartlepool, 1,800,981 tons; the West Midland, 897,651 tons; the Whitehaven, Cleator, and Egremont, 514,495 tons; the Edinburgh and Glasgow, 1,341,514 tons: the Edinburgh, Perth, and Dundee, 513,756 tons; the Glasgow and South Western, 2,475,326 tons; and the Monkland, 1,603,369 tons. The 63,604,434 tons conveyed produced the companies £5,191,193. It will be perceived that, of companies which conveyed less than 500,000 tons in the 12 months, no account has been taken.

AN ILLUMINATING BOMB.—A French lieutenant of Artillery has lately tried, at Namur, a new projectile of his invention. It is intended to light up at night any place it is wished to reconnoitre. The light of the new bomb has shown itself to be very powerful, and it illuminated a radius of several hundred metres. Two or three similar projectiles would be sufficient to light up a plain of very great extent.

THE GOVERNMENT STEAM-RAM, "HECTOR."—This vessel, which was launched from the building yard of Messrs. R. Napier and Sons, Govan, in September last, having nearly completed her armour-plating, arrangements were made on Wednesday, the 17th inst., for having her towed to Greenock by the Sunday morning tide, where she will be berthed in the Victoria Harbour, and at the same place occu-

pied by the "Black Prince" last year. In the harbour at Greenock the "Hector" will receive her machinery and boilers, and be otherwise fitted for sea. Her draught of water is now about 21 ft. The dimensions of the "Hector" are 286 ft. long, 56 ft. broad, and 38 ft. deep, her tonnage being 4,063. She will be propelled by a pair of horizontal engines of 800 horse-power, prepared by the builders, and fitted with a screw. Her masts and bowsprit will be iron, and the latter will be constructed so as to double up when necessary. The cost of her hull alone will be over £170,000. The "Hector" will carry twenty-four 68-pounders, and six 110-pounders on the main deck, with a 110-pounder pivot-gun on the upper deck at the stem and stern. Her iron-plating of 4½ in. thick will extend to a depth of 5 ft. below the water-line. Another vessel named the "Valiant," nearly similar in every description, is also in course of construction at the Admiralty Yard, Isle of Dogs.

THE ROYAL AGRICULTURAL SOCIETY.—The next meeting of the Royal Agricultural Society will be held at Worcester, and the time has just been arranged for the week commencing July 20. The site selected for the exhibition is in the immediate vicinity of Worcester, on the Battenhall property, belonging to Sir Thomas Sebright. The ground selected for the showyard has all just been levelled and drained. The extent is 39 acres, and the fields for ploughing, reaping, mowing, and other agricultural operations, which are near at hand, are, together, above 100 acres more. A branch will be run out of the West Midland Railway, which passes near, into the show ground. The amount subscribed by Worcestershire for the necessary expense of the meeting is £4,720. The special prizes are not yet arranged.

Patents for Inventions.

ABRIDGED SPECIFICATIONS OF PATENTS.

THE Abridged Specifications of Patents given below are classified, according to the subjects to which the respective inventions refer, in the following Table. By the system of classification adopted, the numerical and chronological order of the specifications is preserved, and combined with all the advantages of a division into classes. It should be understood that these abridgements are prepared exclusively for this Magazine from official copies supplied by the Government, and are therefore the property of the Proprietors of this Magazine. Other Papers are hereby warned not to produce them without an acknowledgement:—

STEAM ENGINES, &c., 1576.
BOILERS AND FURNACES—*none.*
ROADS AND VEHICLES, including railway plant and carriages, saddlery and harness, &c., 1569, 1587, 1609, 1628.
SHIPS AND BOATS, including their fittings, 1586, 1590, 1595, 1599, 1601, 1618.
CULTIVATION OF THE SOIL, including agricultural implements and machines, 1573, 1577, 1578, 1627.
FOOD AND BEVERAGES, including apparatus for preparing food for men and animals—*none.*
FIBROUS FABRICS, including machinery for treating fibres, pulp, paper, &c., 1570, 1597, 1606, 1614, 1615, 1620, 1621, 1624.
BUILDINGS AND BUILDING MATERIALS, 1574, 1604, 1616.
LIGHTING, HEATING, AND VENTILATING, 1575, 1580, 1602.
FURNITURE AND APPAREL, including household utensils, time-keepers, jewellery, musical instruments, &c., 1572, 1584, 1593, 1600, 1603, 1610, 1612, 1619.
METALS, including apparatus for their manufacture, 1607.
CHEMISTRY AND PHOTOGRAPHY, 1611.
ELECTRICAL APPARATUS, 1581, 1583, 1626.
WARFARE, 1571, 1589, 1592, 1622.
LETTER-PRESS PRINTING, 1579.
MISCELLANEOUS, 1582, 1585, 1588, 1591, 1596, 1598, 1605, 1608, 1613, 1617, 1623, 1625.

1569. M. WALLS, and J. CROMPTON. *Improvements in railway signals.* Dated May 26, 1862.

This invention is for the purpose of putting on and taking off railway signals, and also for shewing the time that one train has passed to the next train coming on the same line, or when the machine is placed, and to warn a following train of the danger. The patentees fix a pump or cylinder, with the necessary clack piston and tap, in any convenient position to the semaphore or signal post, and feed the pipe and cylinder with any suitable liquid or air. They connect the semaphore to the piston of the pump by a connecting rod, or other suitable means, and the connection between the rails and the pump is accomplished by transverse levers, so that, when an engine or train passes over the rails opposite the semaphore, it acts on one of the transverse levers by means of a tongue or other apparatus, and by pressing down the lever the arms of the semaphore are set in the horizontal position; and at any convenient distance from the said lever they place another transverse lever, which being pressed down by the weight of the carriage, the same as already described and being connected with it by wire or other convenient means, the arms of the semaphore are liberated, and fall; but instead of falling suddenly, they can be regulated to fall at any required degree of motion, according to the pressure of the liquid or air acting on the piston of the pump, thus falling gradually they will not be in the vertical position until the proper time as regulated by railway companies for one train to follow another. And by means of a graduated dial and pointer, they can indicate the exact time between the arms of the semaphore being set and released. And to prevent a sudden pressure on the lever or levers as the weight passes over them, they use a spring, or any elastic substance between the rails and the levers. *Patent completed.*

1570. J. TAYLOR. *Improvements in preparing cotton or other fibrous materials to be spun.* Dated May 26, 1862.

This invention relates to the carding engine, and consists, 1. Of improved modes of giving the to and fro motion to revolving knives or combs. The said knives or combs at each end work loosely, in a stationary, excentric slot, so that, as they revolve, they project, one after the other, beyond the periphery of the roller which contains and propels them, in order to strip the doffing cylinder, and then recede, one after the other, in their slots or grooves. 2. In the application of an angular or other shaped bar intervening between the fibrous material on the doffer of the revolving combs or knives. The patentee applies the said bar for the purpose of consolidating the material on the doffing cylinder, and for preventing the combs from taking it off unequally. 3. In the application of adjustable stop pieces to each end of the loose combs, for the purpose of allowing the said combs to be adjusted separately. 4. In the application of a jet or blast of air adapted so as to act on the selvedges of the sliver, and protect it from being made into waste. And, 5, In the application of an electric band, or an equivalent, for keeping the knives or combs in contact with the inner eccentrics. *Patent completed.*

1571. W. BRIERLEY and G. F. SMEETON. *Improvements in apparatus connected with targets.* Dated May 26, 1862.

Here the inventor uses a rod, carrying a flag or signal, balanced in such a position that the signal will be a little below the upper part of the target, and invisible to the firing party. The whole is nicely balanced by a weight on the signal rod, so that, upon the bull's-eye disc, or plate, on the lower rod being struck by a shot, the shaft working on centred lags, will oscillate freely. The rod carrying the signal, being secured in the boss of the same shaft, will also oscillate, in the manner of a scale beam, or pendulum, until the motion is overcome by its gravity. Two springs are placed on the target for the rods to strike against at each oscillation. The invention also relates to the construction and form of plates to be used as centres, which are made of wrought iron, cast iron, or other suitable metal, in the form of a gong, or disc, or plate, having a bell-mouthed rim thereon; or these plates may be square, with the rim on, as described. The centres are suspended in front of the target, and, when struck by a shot, produce a sound which differs in tone from that of any other part of the target when struck. *Patent abandoned.*

1572. W. CLARK. *Improvements in fastening buttons to garments and other articles.* (A communication.) Dated May 20, 1862.

This invention is not described apart from the drawings. *Patent abandoned.*

1573. W. WORBY. *Improvements in reaping machines.* Dated May 26, 1862.

The patentee claims, 1, So constructing reaping machines that the platform and cutting parts may be turned up, so as to allow of the whole machine passing freely through an ordinary field gateway, and, when the platform and cutting parts are turned down for use in the field, the joints upon which they move allow of rise and fall, according to the unevenness of the land. 2, Causing a series of rakes, or other similar instruments, which, in their rotary action, by being brought in contact with a series of suitable cam surfaces, are caused to act as an ordinary fly for laying the corn, and afterwards removing it, when cut, at the sides of the platform and cutting parts, by suitable mechanical connections, between the platform and rakes, or delivery apparatus, so as to maintain their proper relative position with respect to the platform surface. *Patent completed.*

1574. J. A. C. N. DELPECK. *Improvements in pumps.* Dated May 26, 1862.

This pump, which is of an entirely new principle, may be placed either in a horizontal or vertical position. In both cases it is double acting, *i.e.*, the piston produces at once a vacuum on one side, whilst it forces the water on the other side. In both arrangements the apparatus is composed of an external metallic casing, divided into two distinct portions, the one containing the cylinder in which the piston moves, and which is called the cylinder chamber, whilst the other contains four elastic balls, acting as valves, or clacks, and is called the ball chamber. The cylinder chamber itself is divided into two parts by a vertical partition, or diaphragm, according as the pump is a horizontal or vertical one. In both arrangements this partition is provided at its centre with a round opening, for the cylinder that passes through the same, and on which it is fixed. The tight joint of the cylinder in this partition separates thoroughly the two compartments, which communicate by the interior of the cylinder in which the piston moves. The cylinder is open at both ends, and between its extremities and the chamber ends a space is left for the circulation of the liquid contained in these vessels. The ball chamber is also divided, internally, into two equal compartments, by a vertical partition. Each of these compartments, however, communicates by a wide opening with one of the compartments of the cylinder chamber. *Patent completed.*

1575. R. M. LETCHFORD. *An improvement in the manufacture of matches.* Dated May 26, 1862.

The object of this invention is to produce matches, at a low price, free from sulphur and from objectionable smell. The invention consists in dipping the ends of the usual match splints in, or in saturating match splints with, petroleum, or rock oil. The splints, having been thus prepared, are dipped into any of the ordinary lighting compositions. *Patent completed.*

1576. G. A. HUDDART. *Improved means for superheating steam.* Dated May 26, 1862.

Here the patentee withdraws the steam from the boiler by the aid of a force pump, and discharges it, under pressure, into a superheating chamber, or oven, which receives its heat from a furnace, or furnace flues, into which it is so built that the flame and heated gases may play around it. This superheater he proposes to fit with a series of parallel copper tubes, somewhat like those in a locomotive engine, through which the gases of combustion will pass. *Patent completed.*

1577. J. E. HOLMES. *Improvements in machinery for digging or cultivating land.* Dated May 26, 1862.

This relates to an arrangement and mode of operating a series of spades, prongs, tines, or digging instruments, which are made to enter or penetrate the earth in succession as they are drawn over the surface, and, having penetrated the land, are caused to lift up and turn over the earth, and in so doing to disintegrate and break up the clods. *Patent abandoned.*

1578. J. E. HOLMES. *Improvements in machinery for digging or cultivating land.* (A communication.) Dated May 26, 1862.

This consists of a rotary digging or cultivating implement composed of a strong horizontal shaft, provided with a series of screw blades of from ten to twelve inches in depth, and which are wound at a suitable angle helically round the shaft. This shaft is mounted in bearings at the end of a pair of rocking levers, which have their fulcra on the axle-tree of the running wheels, and rotary motion is communicated to it by a pulley or chain wheel on one end of the axle. The other end of the rocking levers are connected to a bar or block through which passes a vertical screw shaft, by turning which one end of the levers are raised or depressed, and the opposite ends, which carry the shaft of the digging implement, are depressed or elevated when desired. The outer ends of the rocking levers are also provided with quadrant arms, in which are made holes to receive pins, whereby the rocking arms and digging instruments may be kept at any point of depression or elevation required. In front of the rotary digging instrument is placed a series of coulters, which may be raised and depressed with the rotary digging instrument. On the axle of the travelling wheels of the machine, or on the wheels themselves, are fixed two spur or chain wheels, round which, and also round the pulley on the axle of the digging instrument, are passed chains for driving the same. *Patent abandoned.*

1579. J. E. HOLMES. *Improvements in printing machinery.* (A communication). Dated May 26, 1862.

This consists in an arrangement of parts whereby a press for job work may be constructed in such a manner as to be capable of being worked by means of a treadle or winch handle, or by power. *Patent abandoned.*

1580. J. D. T. SPARROW. *An arrangement or arrangements for shading street lights, and in order to protect or shade the eyes of riders and foot-passengers from the dazzling effect of the flames of such lights.* Dated May 26, 1862.

Here the inventor attaches to the street lights metal or other shades, either whitewashed on the side nearest the flame, or fitted with reflecting surfaces, the shades and reflecting surfaces being of such form, and placed at such angle, as to render the flame invisible at the distance of one lamp-post from the next. And he makes such shades either circular (as for lamps or lights at corners or turnings), or portion of square shades, containing one, two, three or four sides, according to the effect desired at each particular spot. *Patent abandoned.*

1581. E. TUCK. *Certain improvements in electrical manipulation applicable to submarine telegraphs.* Dated May 27, 1862.

In place of the present method of completing circuit through the sea, the inventor makes use of the exterior of the iron wire covering of the cable, to which he affixes a covered conducting wire, which is brought into contact with the interior conducting wire of the cable by the instrument for receiving a message. In conveying or delivering a message, this contact is broken, and he makes use of a sheet or piece of zinc (in place of copper) in contact, or placed in the sea, to which is annexed a covered conducting wire, brought into contact with the copper or negative plate of a voltaic battery; this is effected by the recording telegraph instrument, as at present in use. *Patent abandoned.*

1582. C. A. M. DURAND. *A new kind of watermill.* Dated May 27, 1862.

This consists, 1, Of a large basin, or reservoir, fed from a source which, however slight, will allways suffice to maintain the same level of water. The bottom of the basin will be constructed of sandstone, or rough masonry, and covered with slabs of stone, in order to preserve the water, if the supply be limited. 2, Of the pumps which serve to raise the water from the large basin to another fixed above, these pumps being of sufficient force to furnish, together, the quantity of water necessary to turn two stones. 3, Of a second basin, or reservoir, intended to receive the water raised by the pumps, the water falling from them by a conduit upon a large wheel placed beneath. 4, This large wheel, which receives motion by the water falling upon it from the upper reservoir, communicates it, by a horizontal shaft, to the small stones, which are on each side, and, at the same time, to two perpendicular shafts, which work the pumps, so that the entire system is animated by a regular and constant movement, the quantity of water falling on the wheel being always the same, and the pumps re-raising incessantly the water necessary to cause the mill-stones to turn. *Patent abandoned.*

1583. W. E. GEDGE. *Improvements in the manufacture of wire rope or cables.* (A communication). Dated May 27, 1862.

The wire rope or cable forming the subject of this invention differs from those ordinarily made in a most essential point. The six strands, instead of being twisted all to the

right, or all to the left, are twisted three to the right and three to the left, or reciprocally. There are, therefore, three different and equal forces in constant opposition, which naturally destroy or negative each other; hence the equilibrium, or, rather, immobility of the cable, and this constitutes the base of this invention. *Patent abandoned.*

1584. J. HALLIDAY. *Improvements in the manufacture of ornamental trimmings.* Dated May 27, 1862.

In carrying out this invention the inventor cuts by hand, or punches any fabric to a required design, and fills up the insterstices, or parts cut out, with a different material, or uses one material only, and sews the two materials together either by hand or machine, and secures the two together by stitching. *Patent abandoned.*

1585. J. IRELAND. *Improvements in forming moulds for card cylinders.* Dated May 27, 1862.

This consists in using an expanding and contracting core barrel for the card cylinders of carding engines, and coating them with loam in the following manner:—The patentee places the barrel, when expanded to its full size, upon a turn-table, and causes it to revolve past one or more sweeps attached to one or more slide rests, for the purpose of acting upon the loam as it is placed upon the barrel, and regulating the size of the core. He also uses a sweeping frame, having one or more spaces in which a sweep is moved, so as to form spaces in the core for the thickening ribs of the card cylinder. In connection with the aforesaid core barrel, he uses an outside box or casing coated with loam in the inside by a sweep attached to a slide rest. When the core or casing are finished and dried, they are placed upon a plate which is made perfectly true, and when thus put together the space between them will form the cylinder when the metal is run into it. After casting in the usual way, the core barrel is contracted and drawn out so as to allow the cylinder to contract. By these means card cylinders require no balancing, and are made with greater truth and in less time than by other means. *Patent completed.*

1586. H. D. P. CUNNINGHAM. *Improvements in anchors.* Dated May 27, 1862.

This invention consists in constructing the arms of anchors to terminate in a "pick," or penetrating bar, similar to that of an ordinary pickaxe, and in forming a fluke or broad holding surface at the inner end of the pick, and between it and the shaft or shank. The pickaxe termination of the arms will ensure penetration, while the fluke or broad surface thereof or thereon will impart great holding power. In weighing, also, the particular construction of the arm will enable it readily to break out of the ground. *Patent completed.*

1587. W. CLARK. *Improvements in brakes for railroad carriages.* (A communication.) Dated May 27, 1862.

Here the inventor employs a tumbling rod, placed longitudinally under each car just above its axles, the tumbling rods of the several cars comprising a train being connected together, and so arranged that they, with their draw bars, may be rotated and also lowered and raised; and by suitable gearing connected with a slide and belt shipper, the above parts being used in connection with two cones, a belt, and two cylinders, one cone and cylinder placed on an axle of each car, and the other cone and cylinder on a lever, which is connected to a chain attached to the brake bars. By these means the brakes may be applied by a single person to all the cars in a train simultaneously. *Patent abandoned.*

1588. F. TOLHAUSEN. *Applying various mineral and organic substances to wire gauze, and metallic asbestos tissues, for rendering said tissues available for ornamental and useful purposes.* (A communication.) Dated May 27, 1862.

This consists in filling up the interstices in tissues of the kind above named, with compounds of transparent and opaque substances, which may be coloured by means of gum lac colours mixed with varnish or gelatine, and by which process the patentee renders the said metallic or asbestos tissues fit to be used for ornamental purposes, such as blinds, signs, lamps, and lanterns, and so forth. *Patent completed.*

1589. G. SANBORN. *Improvements in revolving breech-loading firearms.* (A communication.) Dated May 27, 1862.

This relates to a novel construction and arrangement of the parts of the frame of revolving breech-loading firearms. The barrel is of the ordinary construction, and may be either rifled or smooth bore. The frame into which the barrel is screwed is of dimensions to contain the cartridge cylinder, and is fixed upon or constructed as a part of the stock or handle of the firearm. This frame, which is made in parts, has a hinge joint situated upon its upper side and near the rear end of the cartridge cylinder, and at its diagonal corner a spring catch or lock, which, in connection with the said joint, firmly receives the frame. The cartridge cylinder, which has a recess in front, revolves upon a spindle or rod fixed in the front part of the frame, and the rear end of said cylinder fits into a chamber which constitutes a portion of the frame. In the centre of this recoil chamber is a circular or ring-formed recess, which receives, when the frame is locked, a projecting ratchet, by which the cylinder is revolved, and which constitutes a part of the said cylinder. The interior of this recess is left flush with the surface of the recoil chamber, thus forming a pin, which enters the rear end of the cartridge cylinder to secure the same firmly during the discharge of the pistol or gun. The ordinary means in connection with the ratchet on the cylinder are used for rotating the said cylinder. *Patent abandoned.*

1590. J. HAY. *Improvements in war ships, also applicable in part to land and floating batteries, or forts, and in part to mercantile and other vessels.* Dated May 27, 1862.

We cannot here quote the details of this invention. *Patent abandoned.*

1591. J. DUFFUS. *Improved apparatus for measuring piece-goods or webs.* Dated May 27, 1862.

This apparatus comprises a roller, round, or partly round, which the article is made to pass, and the spindle of which communicates by a wheel-work train with the index of a dial, showing yards or other desired measure, provision being made for winding the fabric upon a roller, board, or spindle, by means of a crank handle. Provision is also made for pressing the fabric closely in contact with the measuring roller, so as to insure the accurate turning of this roller, and its correct measuring completely to the extreme end of the piece passing through. *Patent completed.*

1592. W. PALMER. *Improvements in revolving firearms.* Dated May 27, 1862.

This invention consists, 1, In the employment of a carrier intermittently revolved by suitable automatic mechanism, and presenting a loaded chamber at the rear of the barrel, pausing while the charge is fired, then proceeding on by the said mechanism, and presenting another chamber on the line of the barrel, the previous discharged chamber being allowed to drop out of the said revolving carrier. 2, In combining with the said revolving carrier a hopper slide or opening, so located on a plane parallel, or nearly parallel, to the axis of said revolving carrier that the said chambers shall, by their own gravity, descend into the grooves provided in the said revolving carrier, as such grooves are successively presented for the reception of the said chambers. 3, In combining with the said revolving carrier a shield or casing to retain the said chambers in the revolving carrier from the point at which they drop from the said hopper slide or opening until they have been fired, after which the said chambers are allowed to drop away by their own gravity. 4, In the employment of a revolving cam in connection with the said rotary carrier, the said cam being so formed as to allow the necessary pause for the discharge of each chamber, or brought opposite to the barrel, the said cam also acting to hold the carrier and the chamber so that the chamber is on the line or the barrel when fired. 5, In the employment of automatic mechanism to press the chambers to the rear end of the barrel after being brought to line with the barrel by the aforesaid rotary carrier, so as to prevent the escape of gases, &c. 6, In the combination with a detached section of a barrel or chamber of a metallic cartridge, so formed that the metallic case of the said cartridge enters the rear end of the barrel when pressed forward, as aforesaid. 7, In constructing the mechanism that rotates the carrier in such a manner that a hammer is liberated to explode detonating powder and fire, the piece at the bind of the said carrier is stationary, and then recock the hammer before the carrier commences again to move the rotary automatic mechanism, giving these relative movements to the hammer, and the carrier being unchecked in its revolution. 8, In the mechanism employed for giving end motion to the said carrier. 9, In the means for moving the chambers with the carrier in its endwise action. 10, In the mechanism for revolving the carrier. *Patent completed.*

1593. D. T. MOSS. *Improvements in fastening horse-shoes.* Dated May 27, 1862.

For the purposes of this invention, horse-shoes are made in the ordinary manner, and of the usual forms, and to each shoe two thin metal straps are applied, by peference of steel; one end of each of these straps is fastened to the fore part of the shoe, but at some distance apart, so that when these straps are crossed on the front of the hoof, the point of crossing is on the front and between the top and bottom of the hoof. The fastening of the front ends of these metal straps to the shoe is, by preference, by means of screws, but, when the desired fastening has been obtained, the ends of the screws are rivetted, or upset, so that they may not become loose. At the heel of each shoe, opposite the inner and outer quarters of the hoof, there are applied two lugs, or plates, which rise to the upper part of the hoof; one of these, it is preferred, should work on a hinge joint. These plates, or lugs, have holes through them at their upper ends, through which short tubes (which are fixed to the back ends of the metal straps) pass. The short tubes are formed with internal, or female screws, which receive male screws with spreading heads, by which the ends of the metal straps are retained in their positions. These short tubes also receive the ends of a vulcanized india-rubber strap, which is applied at the back of the hoof. The holes through the ends of the india-rubber strap, through which the short tubes pass, are strengthened with metal eyelet holes. *Patent abandoned.*

1594. G. H. DAW. *Improvements in firearms.* Dated May 27, 1862.

These improvements are applicable to the breech-loading firearm described in the specification of a patent granted to Francois Schneider, dated the 11th day of June, 1861 (No. 1,487). In order that the lever for bolting the barrels, and which works in a vertical direction, may, when the barrels are in place, be securely held under the trigger guard, the patentee joints to it a small catch; this catch has a projection on it, and, when the lever is up under the trigger-guard, it enter a hole or recess therein; a spring, with which it is fitted, keeps it up. To open the breech, it is necessary only to press on the catch to cause its spring to give way, so as to withdraw the projection from the hole or recess, and free the lever. This improvement is also applicable to other breech-loading firearms in which the lever works vertically, and lies along under the trigger-guard when out of use. Another improvement relates to the manner of securing the barrels to the fore part of the body, as described in the specification of Schneider's patent; there is a projection on the barrel lump which enters a recess in the fore part of the body. Now the patentee finds it more convenient to reverse this arrangement, and to form the projection on the fore part of the body, and the recess in the barrel lump. He prefers, for the sake of adjustment, that the projection should be a screw, as formerly. This improvement is applicable in other breech-loading arms, in which the fore part of the body is jointed to the hinder part by a joint independent of the barrels. Another improvement on the arrangement described in the specification of Schneider's patent consists in taking the strains produced by the explosion off the joint, by means of a bar introduced across the recess into which the barrel lump fits. The barrel lump is notched, to take the bar, which may either be made in one piece, with the body, or the body may be drilled, and the bar tapped or driven into it. This arrangement is also applicable to other breech-loading firearms, in which the body is similarly constructed. Another improvement in the arm described in the specification of Schneider's patent, has for its object the preventing the slide, which expels the exploded cartridge, from being drawn out of its place when the breeches are open, or when the barrels are removed from the stock, and consists in applying projections to the forked ends of the slide, which, coming against the guides, stop the slide when it is out as far as it ought to come. The slide may still be removed for cleaning, by springing the forked ends of the slide apart; this improvement is applicable in other cases in which slides of this description are applied. Another improvement, applicable to the arm described in Schneider's patent, and other arms in which the cartridge contains the fulminating material, consists in working the pistons, which receive the blow of the hammer, and explode the cartridge by means of straight, in place of spiral, springs, and thus greater durability and certainty of action is obtained. Another improvement on the arm, described in the specification of Schneider's patent, and other breech-loading arms, in which there is a joint between the barrels and stock, consists in applying a connecting link behind the joint, so as to connect the breech ends of the barrels with the stock, in order that, in opening the breech, the link or lever may retain the barrels when they have moved a sufficient distance, and thus the great strain, otherwise thrown on the joint, is avoided. Another improvement consists in an arrangement of the back sight of firearms, and consists in connecting the slider to the bed by a link, jointed to the slider at one end, and capable of sliding along the bed at the other end in a slot, or way, formed for it. This link serves both to keep the slider in place, and to prevent light being seen beneath it. *Patent completed.*

1595. O. H. HUDSON. *A defensive armour.* Dated May 27, 1862.

This invention consists, chiefly, in the use of certain means, appliances, and arrangements, for the purpose of lessening the percussion of projectiles upon the backing or supports of metallic armour by the introduction of water between the said supports and the protecting armour, and also around its fastenings. The patentee effects this by covering the surfaces exposed to the action of projectiles with a metallic structure of a cellular form, presenting a strong surface to the action of the projectile, and from its construction capable of holding and retaining water within its cells, or between its inner surface and that of the supports or backing. This arrangement or system of defensive armour is applicable to all kinds of objects, whether moveable or fixed, on land or water, although chiefly applicable to ships. The beneficial results to be obtained from the introduction of water between the armour plates and their supports are based upon two well-known properties of water, viz., its almost total incompressibility, and its power of transmitting force equally and in every direction. He prefers that the water should be distributed, whether within or behind the structure of the armour, in divisions or compartments, so that the destruction of any one division would not materially affect the perfect action of the others. In carrying out the principle of introducing water in compartments between the supports and the armour, or within the structure of the armour, several methods may be adopted, but those which he prefers as part of this invention are illustrated in the drawings. *Patent completed.*

1596. H. EATON. *Improvements applicable to presses for baling purposes.* Dated May 28, 1862.

This invention relates to that part of baling presses termed the "stillage," which is commonly formed of a bed of wood faced with metal plate, and provided with grooves to enable the hoops or ropes to be secured round the bale when pressed. As various sizes of bales are required to be made up in the same press, these common "stillages" have to be changed, and as many stillages are required to each press as there are changes in the distance between the hoops or ropes on the bale to be made up. Now this invention relates to a mode of constructing a universal stillage, practically applicable to every size or distance between the hoops or ropes to be placed on the bales, and it consists of a bed secured to the press in the ordinary manner, this bed being faced with a plate of iron which overhangs the bed at opposite sides, and is provided with a series of slots for securing a series of ribs close against each other, so as to cover the entire surface of the bed. Buttons or T-heads from the ends of the ribs enter the slits or slots in the plate, and are thus held up, the ribs being kept in their places by a catch or bar. With this improved stillage each or any of the ribs can be removed or replaced, and the stillage can be prepared for any size of bale by removing those ribs which come opposite those parts of the bale where the hoops or ropes are required, and by replacing those ribs which may have been previously removed. The mode of securing the ribs may be variously modified; the ends may be secured in slots, or grooves, or otherwise. *Patent completed.*

1597. J. H. KIDD. *An improved manufacture of compositions applicable for waterproofing fabrics for coating and protecting various articles, and for various other purposes.* Dated May 28, 1862.

The patentee claims, 1, A composition formed by the combination of oxydized oil, and a base formed of wax, mutton suet, and resins, and such colouring matters as may be required, as described. 2, A composition formed by a combination of his india-rubber or gutta percha, with wax, mutton suet, and resins, as described. *Patent completed.*

1598. J. SIMPSON. *Improvements in machinery or apparatus for cutting or producing mouldings upon surfaces of wood or other suitable material.* Dated May 28, 1862.

This invention consists in a heavy bar of metal or wood supported upon a shaft at the end of its length, such shaft having bearings on a suitable framing. At one or each end of this bar or block a blade or cutter is secured, so formed as to cut the material under operation into the form or

moulding required, the bar being caused to rotate by means of a handle on the centre shaft, a self-acting feeding apparatus being provided to propel the wood. The action of the cutters upon the material partakes of a chipping nature, the chief feature in the invention being the distance of the cutter from the centre of support, whereby there is more leverage obtained and greater steadiness effected in the cutting, the high velocity of revolution not being required as in smaller cutters. *Patent completed.*

1599. J. Rogerson. *An iron floating dock to be used for the purpose of building and repairing ships, steamers, barges, and floating vessels of all descriptions.* Dated May 28, 1862.

We cannot here quote the details of this invention. *Patent abandoned.*

1600. C. Cohen. *Improvements in walking umbrella and other like sticks.* Dated May 28, 1862.

This invention consists in the mode of making and securing the handle of canes or sticks of all descriptions. The cane is split down the middle about six to twelve inches, and a wedge-shaped piece of wood, ivory, or other like material is inserted of the shape and form desired; the two halves of the cane are then bent round and glued, or cemented to the handle, and follow the shape of the same. The handle has thus a flexibility and strength, which prevents its breaking on letting it fall or receiving a sudden blow as the stock is distributed in the cane. *Patent completed.*

1601. J. F. Harrison. *Improvements in preserving the bottoms of ships from the attacks of carbuncles and other like incrustations.* Dated May 28, 1862.

In carrying out this invention the patentee applies to the bottoms of ships or vessels plates or sheets of wrought iron, or cast iron, or other metals or admixtures of metals, or slate covered with vitreous glaze, or enamel fused at a high temperature, or with water, glass, or silicate of soda or potash, which latter may be applied either direct to the bottoms of ships, or on plates or slabs to be affixed thereto. These covered sheets or slabs are to be affixed to the bottoms of vessels or ships, by and of marine glue, or other suitable glue or adhesive mixture, or by the aid of Portland cement, or other cement, or by screws, rivets, or other fastenings. *Patent completed.*

1602. R. Martindale. *Improvements in the manufacture of globes and glasses, more particularly applicable to hydrocarbon and spirit lamps, and also in fastenings for securing the globes or glasses in those and other descriptions of lamps.* Dated May 28, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1603. T. Turner. *Improvements in machinery for scouring and polishing knitting and other pins and needles.* Dated May 28, 1862.

The knitting or other pins or needles to be polished are placed and held for part of their length between clamps or surfaces, one of which is pressed down by spring pressure, or other suitable means, with sufficient pressure to retain the pins, and at the same time to admit of their rotating by the to and fro sideway movement of the upper clamping plate or surface, to which motion is communicated in any convenient manner. The projecting parts of the pins pass between surfaces covered with buff leather, or other suitable material, prepared with oil and emery, or other scouring and polishing materials. The surfaces are caused to travel to and fro in any convenient manner along the length of the pins or needles, whilst they are caused to rotate by the sideway movement of one of the clumping plates or holding surfaces. The knitting or other pins or needles are first acted upon by the surfaces prepared with coarse materials, suitable for scouring off the scale and rough surface of the articles, after which they are operated upon by surfaces prepared with finer materials, for finishing and polishing. When a portion of the length of the pins or needles has been operated upon, they are taken out of the clamps or holding surfaces, and the ends are reversed so as to complete the scouring and polishidg of their entire length. *Patent completed.*

1604. H. Saunders and J. H. Mills. *Improvements in the manufacture of venetian blinds and other window blinds, and in apparatus for raising and lowering the same.* Dated May 28, 1862.

This invention has for its object, in the first place, the construction of the blinds, and the combination therewith of apparatus for raising and lowering the same, in such a manner as to admit of the several laths thereof being packed together at the top instead of at the bottom as usual. For this purpose the several laths are respectively connected to a chain at each end, such chains being adapted to work in gear with a pair of corresponding toothed wheels, by the revolution of which the several links of the blind are successfully carried forward and packed together in a suitable receptacle at each side of the window, being guided into their respective places by means of guides, which are in some cases fixed, and in others moveable on centres. By thus packing the chains, the laths will become packed likewise. In lowering the blinds, the several links of the chains are successfully brought out of their receptacles by the revolution of the wheels, in the direction contrary to that in which they were turned for raising the blind. The laths of the blind are kept at any desired angle so as to admit more or less light by means of spring barrels, with cords fixed to tapes on each side of the blind, such cords being wound on to the barrels on lowering the blinds, and off them on raising the same. By this means, the several laths are kept in correspondiug positions during the raising or lowering of the blind. The invention consists, in the second place, in adapting and applying to venetian blinds, apparatus known by the name of "lazy tongs," for the purpose of causing the laths to approach near together gradually throughout the blind when it is raised, instead of bringing the laths at the bottom of the blind close together, as usual. And the invention consists, in the last place, in fixing the raising and lowering cord of venetian or other blinds so as to run on a spindle inside a tube on the end of the ordinary roller, for the purpose of allowing the blind to extend to or nearly to the whole width of the window, instead of leaving the usual space between the end of the blind and the side of the window. *Patent completed.*

1605. J. Hurst, jun., and E. O. Taylor. *Improvements in means or apparatus for evaporating water and other fluids, and in economizing the use of steam.* Dated May 28, 1862.

The object of these improvements is to obtain a succession of chambers for the passage of the products of combustion from the fire used to heat steam boilers, or other evaporating vessels, adapted to effect repeated separation and re-admixture of the heated products of combustion in their passage from the fire, and a consequent absorption of an increased amount of heat therefrom. For this purpose, the flue space is at intervals, formed into what may be called chambers, with series of valve tubes for the free passage therefrom of the water or other fluid, and adapted to separate the products of combustion, whilst the intermediate parts or chambers are provided with smoke tubes, by which a re-admixture or other separation of the products of combustion is obtained, and so on. And the patentees make the smoke tubes of the succeeding chambers progressively larger than those of the preceding. Passages to the respective chambers are obtainable by the introduction amongst the other tubes of larger tubes, not only from one chamber to the next, but also to the outside of the boiler for repairing or cleaning. They apply the tubes to such and other evaporating vessels, by parts of the ends of such tubes being turned down to pass into holes in the plates to which they are applied, and they form such holes tapered or bell-mouthed, so that the ends of the tubes projecting therethrough may be better spread out therein in rivetting, and sometimes they increase the holding by the application of rings. The improvements relate, secondly, to conducting the smoke to a chamber or casing around the steam cylinders, and they apply scrapers or brushes to keep the surfaces thereof clear, by which heat will be imparted to such cylinders and the use of steam economized. *Patent completed.*

1606. R. A. Brooman. *Improvements in circular looms, or machinery for the manufacture of looped or knitted fabrics.* (A communication.) Dated May 28, 1862.

This invention is not described apart from the drawings. *Patent completed.*

1607. J. H. Johnson. *Improvements in the manufacture of tinned lead pipes, and in the apparatus employed therein.* (A communication.) Dated May 28, 1862.

This invention relates to an improved system or mode of tinning or coating the interior and exterior surfaces of lead pipes made by hydraulic pressure, and consists of a peculiar mode of supplying one or more layers or coating of tin over the lead surface of the pipe, so as to obtain coatings of different thicknesses as desired. This is accomplished by having a reservoir of molten tin placed above the tinning tool, so as to supply the tin constantly thereto. The tin is introduced to the interior of the pipe by an opening in the mandrill, which regulates the diameter of the same, the tin being applied continuously, as fast as the tube is made, either to the interior or exterior thereof. *Patent completed.*

1608. W. Blackmore and H. Lamb. *Improvements in burning limestone and generating steam.* Dated May 28, 1862.

For the purposes of this invention, in order more advantageously and economically to burn the fuel used, whether coal, turf, or peat, when generating steam, limestone is introduced into and burned in the ordinary steam boiler furnace, by which lime is manufactured at a cheap rate, whilst the fuel employed is found to be more effective in generating steam than when burned in the same furnaces without the introduction of limestone. This invention is peculiarly useful when using the furnaces of tubular steam boilers having fire-boxes, such as are usually applied to locomotive engines. In practice, the limestone in lumps is spread over the fire bars of the furnace, and the fire is made thereon, and the fire is kept up by additions of fuel together with quantities of limestone mixed with or thrown on to the fuel therewith. *Patent completed.*

1609. J. A. Ransome. *Improvements in the manufacture of, and in fastening railway chairs with wood trenails.* Dated May 28, 1862.

The patentee claims the manufacture and use in fastening railway chairs of compressed wood trenails, drilled longitudinally from the heads towards the points, but not through the points, in order that they may receive metal spikes in such manner that they shall derive their principal holding power from the expansion of the trenails after they have been driven, substantially as described. *Patent completed.*

1610. J. Critchley. *An improved rib fastener for umbrellas and parasols.* Dated May 29, 1862.

This invention consists in the application of a sliding bush to the stick of the umbrella or parasol, to which bush a cupola-shaped cup is attached; the bush is provided with a slot forming with a stud in the stick a double bayonet joint. When the umbrella or parasol to which the improved fastener is applied is closed, the bush is lowered on the stick to enclose the ends of the ribs in the cupola-shaped cup, and the bush is turned slightly round to bring the angle part of the slot on to the stud which retains the fastener in its place. The fastener is held beyond the ends of the ribs by sliding the bush up the stick of the umbrella or parasol, and securing the angle slot at the other end thereof to the stud in the stick of the umbrella or parasol. *Patent completed.*

1611. J. Hurst, jun., and J. Wood. *Improvements in stereoscopic apparatus.* Dated May 29, 1862.

The object of these improvements is to neutralize the granular, fibrous, and general coarseness of objects seen through stereoscopic glasses, especially when high magnifying powers are employed, and also to produce various changes of effect to such objects. For this purpose the patentees apply tinted media in position that the direct or reflected rays of light falling on the front of the picture may pass through such media, without intercepting the vision. They also apply such media for the passage of the rays of light on to the front of the picture, in combination with other tinted media at a short distance behind the picture, when the picture viewed is transparent, depending upon the magnifying power employed. The media may be tissue paper, gelatine, glass, or other suitable transparent material, and by varying the tints very pleasing changes may be obtained at morning, or evening, or other times of the day or night, summer or winter, or other changes of the season, or of the atmosphere. Also, they apply tinted, transparent, or semi-transparent media at a short distance behind the picture, so as to procure varied effects to the picture when the picture viewed is transparent, by connecting such transparent media by cords, strings, or chains, or otherwise, so that there may be intervals between the respective media when the natural colour of the transparency may be seen. They also apply, in connection with stereoscopic apparatus, a lamp with a shade or shades, lenses, and transparent or semi-transparent media of various tints and shapes, adapted to obtain on the same picture the effects of sunrise and sunset, moonlight, and other periodical or atmospherical appearance. *Patent completed.*

1612. P. Boissett and B. Antognini. *Improvements boots and shoes.* Dated May 29, 1862.

This invention consists in the combination with caoutchouc or india-rubber soles for boots or shoes of a metal piece or pieces, or nuts, with suitable thread holes for the reception of screws, whereby the upper leather and inner soles are securely fastened to the said caoutchouc soles. Further, in the combination with the india-rubber or caoutchouc heel of metal points, to prevent the wearing away of said heel, and likewise in the combination with the india-rubber or caoutchouc heel of a box, or capsel, to attach a spur to the heel. *Patent completed.*

1613. H. Boetius. *A new mode of colouring (refrigerating) hot liquids and condensing steam.* Dated May 29, 1862.

We cannot here quote the details of this invention. *Patent abandoned.*

1614. G. Ashton. *Improvements in dyeing fibrous substances, and in the means or apparatus employed for that purpose.* Dated May 29, 1862.

The patentee claims the method of employing bar-wood or other dye-woods, or wares, in the process of dyeing fibrous substances, by having a perforated false bottom in the dye vessel to prevent the wood or wares coming into contact with the fibrous substances being dyed. *Patent completed.*

1615. J. D. Lee and J. Crabtree. *Improvements in looms for weaving.* Dated May 29, 1862.

This invention consists, 1, In working the shafts or treddles by the ordinary jack rods, in combination with hooked catches and grip levers, or knives, operated by tuppers on the low shafts, the said catches being brought into contact with the said levers by means of peg lags, or other suitable indicating apparatus, aided by springs, by which the inventors obtain a double lift. 2, In working or operating the picking levers by pinions and racks, in combination with double-nosed tappets and moveable friction pullies, which are brought into, or out of, contact with the said noses, as required, by levers and rods, actuated by a changeable chain of tuppers, whereby any number of picks can be made from one end of the loom, in succession, up to the number of change shuttle-boxes employed. 3, In the means of stopping the loom instantly when a shuttle remains in the shed, which is effected by having fingers, so placed as to be operated by the loose reed, and brought into contact with a lever, which acts upon the strap guide, and also against the stops, which prevent the crank-shaft from passing the centres. *Patent abandoned.*

1616. W. Perks. *An improvement or improvements in metallic sash-bars for windows, skylights, hothouses, and other like purposes.* Dated May 29, 1862.

According to this invention, the patentee makes the metallic sash-bars very nearly of the ordinary figure, that is, of the figure, in cross section, of an inverted T; but he makes the top of the vertical rib somewhat thicker than the other parts of the rib. Upon the said vertical rib of the sash-bar he places a folded or doubled metallic strip, which fits upon the said rib and clips it closely, the lower edges of the said double strip being turned into a nearly horizontal plane, so as to cover, or partly cover, the horizontal parts of the sash-bar on which the panes of glass rest. The said folded or doubled metallic strip is fixed upon the sash-bar by its opposite sides being partially separated when it is placed upon the bar and allowed to close, and thereby fix itself. *Patent completed.*

1617. C. D. Abel. *Improvements in apparatus for raising, propelling, or exhausting air, water, or other fluids or gases.* (A communication.) Dated May 29, 1862.

This invention has reference to that class of apparatus for propelling or exhausting air, water, or other gases or fluids, in which the same is impelled forward in a linear direction, by being acted upon by helical or screw blades, or vanes, rotating round a central axis inside a fixed casing. This invention consists in forming the rotating vanes, or blades, of such apparatus of only such a radial depth inwards from the circumference of the casing as to constitute an annular fan-blower, or propeller, acting upon the air, water, or other gas or fluid, which is conducted to the same in the manner hereafter described. The diameter of the casing and fan is enlarged from that of the conducting tubes, so as to present an annular sectional area approximating to the sectional area of the conducting tube. The blades, or vanes, are, by preference, attached to the external circumference of a drum, fixed on the spindle, carrying a pulley, to which rotary motion is imparted; but they may also be fixed to the internal circumference of a loose ring, forming part of the casting, to which ring rotary motion is imparted from the exterior in any suitable manner, by which arrangement an internal spindle might be dispensed with. The invention consists, further, in imparting a peculiar form to the vanes, or

blade, of the fan or propeller; these are placed in an oblique position to the axis of rotation, but, instead of being formed, as usual, entirely as an ordinary screw-blade, the ends only of the blades, or vanes, are so formed, the outlet side having, however, a greater pitch than the inlet side, and the middle portion being formed with a curvature, which is concave, in the direction in which the air, water, or other fluid, is propelled, and the surface of which is generated by a straight radial line, moving in a curved oblique direction, on the surface of the drum. Further, the invention consists in fixing guide vanes, either both on the inlet and the outlet sides of the rotating fan-blower, or propeller, or only on the inlet or the outlet side. Further, this invention consists in conducting the air, water, or other fluid, from the inlet tube to the increased diameter of the annular fan-blower, or propeller, by a conical guiding surface, or "ogival," projecting from immediately below the inner edge, either of the guide-blades or vanes, or of the rotating blades or vanes, when guide vanes are not employed, and terminating in a point; its surface is formed, by preference, with such a curvature as to guide the air easily, and with the least possible obstruction to the revolving vanes. *Patent completed.*

1618. R. GRIFFITHS. *Improvements in marine propellers for ships and boats, and for the sheathing of iron ships with metal sheathing to keep them from fouling.* Dated May 29, 1862.

This invention consists, 1, In constructing screw propellers for steam ships, and boats with blades and centre boss of similar form and construction (or the blades may be cast on the boss) to those described in the specification of a patent granted to the present patentee on the 20th Feb., 1858 (No. 319), but having four blades (or two sets of blades) which are to be fixed either to the same boss or to separate bosses on to the screw shaft, and so fixed that one set or pair of blades is placed before the other set or pair of blades, that set next the shaft to be of larger diameter than the after set, so as to get a greater hold on the water for propelling the ship. 2, Relates to side wheel propellers, which he proposes to construct of discs of suitable diameter, having the centre parts constructed with arms and centres similar to those generally used for paddle-wheels, but having the outside rims of such discs corrugated, or in a zigzag form, instead of being flat, in order to offer sufficient resistance, when driven through the water, to propel the vessel. Either one or a series of these discs can be used on each side of the vessel, as may be required, to propel the ship, or the outside rims may be made flat, and the inside rims only be made corrugated or in zigzag form. 3, Relates to the sheathing of iron ships with copper or other suitable sheets of metal (which sheets being perforated with holes stamped therein) to keep them from fouling, and this he proposes to do in the following manner:—The bottom of the ship should be first well cleaned and painted over with one or more coats of red lead paint, or any other suitable material, to preserve the iron. He then covers the part required to be sheathed with metal sheathing with some prepared adhesive material, such as a mixture of tar, pitch, or other suitable substance, and upon that he lays a coating of felt, gutta percha, or other suitable materials, and on that he again places another coating of adhesive materials, upon which he places the perforated metal sheathing, which is made warm on being applied to the ship's bottom, and is pressed on to the adhesive material until it comes through the perforated holes made in the metal sheathing. Or the holes can be filled with stout metal nails, made rough so as to set and fix themselves in the adhesive materials. He then proposes to solder, fold, or overlap the edges of the sheathing sheets together, and to line the sides of the ship at or above the water line with a cleating of wood, well secured to the vessel, so as to protect the covering and adhesive materials, and to which he secures the edges of the sheathing metal with sheathing nails. He also proposes, if necessary, to place narrow pieces of elastic substances (or strips of wood), well secured to the ship, along the ship's side, at suitable distances apart, to which he fixes the sheathing with nails, in the same manner as above proposed to the cleating. *Patent completed.*

1619. J. PATERSON. *An improved hemmer or instrument for turning over the edges of a binding or strip of linen, or other materials, and preparing it for stitching in sewing machines.* Dated May 29, 1862.

This improved hemmer consists of a conical plate of metal, the edges of which are folded over on each side from the centre into a double fold; from the back part of the plate the edges are removed. The hemmer is fixed on its side upon a bed plate, and at the rear of the hemmer the patentee fixes an upright with a spring. *Patent completed.*

1620. W. CLARK. *Improvements in throwing the shuttles of looms.* (A communication.) Dated May 29, 1862.

This invention relates to an improved method of throwing the shuttle a given distance at a uniform and regular speed, by the application of the attractive force of the magnet, or electro-magnet, as a motor; thus a shuttle is furnished wtih an iron armature, acted on by a magnet or electro-magnet placed in proximity to it, and having a suitable motion imparted to it at a given speed, which will be thence transmitted to the shuttle. The advantages of employing this improved method of driving the shuttles are—1, Prevention of all jerking and consequent rupture of the threads. 2, Counteraction of the dead weight of the shuttle, which permits of its carrying an additional amount of thread. 3, The shuttle never stops at any point of its traverse. 4, Great saving of time by reason of its uniform motion, uninterrupted by any rupture of the thread or stoppage of the shuttle. 5, The weaving may be effected with much more uniformity than formerly. 6, The capability of weaving all kinds of fabrics, the widths of which will be limited only by the size of the other parts of the loom, independently of the throw of the shuttle. 7, In this manner fabrics of great width may be woven, thereby obviating the necessity of having joins or seams. The motion of the shuttle may be produced by the influence of the electro-magnetism alone constituting the motive power, or it may be obtained by the aid of a self-acting apparatus, and thus form a self-acting shuttle. *Patent completed.*

1621. N. LAWTON and R. P. WHITWORTH. *Improvements in engines for carding cotton and other fibrous materials.* Dated May 29, 1862.

This invention relates to the mechanism for removing the fibrous material from the doffers, and to that arrangement for this purpose, wherein the doffer comb is secured to a shaft passing in front of the doffer, the shaft receiving oscillations from a crank or eccentric working directly into a slotted lever or arm on the end of the comb shaft. The improvements consist in the peculiar construction and arrangement of the above desired mechanism. The patentees strengthen the shaft to which the doffer comb is attached by a rib on that side of the shaft opposite to the comb, so as to resist the bending action put upon it by the screws, by which the comb is kept tightly stretched. They form the pulley in which the crank or radius-pin is fixed, and its axis, all in one piece, or they fix the pulley on a short shaft, and arrange it so that it can rotate in a bearing cast in one of the brackets supporting the ends of the comb shaft. The crank pin is formed by a set screw which screws into the side of the said pulley, and this said set screw passes through a bush having a collar formed upon it; this bush passes through, and can rotate, freely in a hole made through a die, which can slide freely in the slotted cain on the end of the comb shaft. The sliding die has two recesses, into which pieces of leather or other similar material is inserted, this leather working against the slides of the slot in the slotted arm. The slotted arm is placed so as to descend vertically or thereabouts from the end of the comb shaft when it is at its mid oscillation, and a hole is drilled from the upper side of the boss of the slotted arm into the upper end of its slot, and by this means oil can be supplied to the sliding die at any time without stopping the engine. For very quick speeds they sometimes use a bowl in place of the sliding die. *Patent completed.*

1622. S. MINTON. *An improved construction of revolving batteries.* Dated May 29, 1862.

This invention relates to improvements on the floating rotating battery, for which the present inventor obtained, in conjunction with Richard Handley Thomas, letters patent, dated April 3, 1858 (No. 715). In the specification of that patent, in order to facilitate the turning of the shot-proof chamber containing the guns, he showed and described a deep tank for receiving a water-tight compartment or caisson, forming part of a rotating chamber. The caisson portion was situate below the gun platform, and was immersed in water in the tank, thus giving the chamber the requisite amount of buoyancy. This elongation of the chamber and the deep tank for receiving it was for the sole purpose of giving buoyancy to the battery, and involved a considerable outlay for its manufacture. He now proposes materially to reduce the depth of the caisson and tank, and to obtain the requisite buoyancy by the use of mercury in place of water. The ventilation will be at the top, and access may in general be conveniently gained to the interior of the battery by a central hollow shaft, around which the annular portion of the chamber revolves. *Patent abandoned.*

1623. W. FOOTMAN. *Improvements in the treatment and use of sewage and liquid manure, and in reservoirs and pipes to be used therein.* Dated May 30, 1862.

The nature of this invention consists, 1, In constructing tanks or reservoirs to receive the sewage, and to effect a separation of the liquid from the floating and sedimentary matter contained therein. 2, In laying down an inlet system of underground pipes for manuring the land with liquid manure, in conjunction with an outlet system of underground pipes for draining the land from water. 3, In the manufacture of the said underground pipes to be used for the above purposes. *Patent abandoned.*

1624. J. DATICHY and E. SABATIER. *Improved machinery and process for making pulps for the manufacture of paper and other purposes.* Dated May 30, 1862.

This invention consists of new and improved machinery and apparatus for converting rags, and all kinds of textile and fibrous matters suitable for the purpose, into pulp, stuff, or pile, for the manufacture of paper, papier mache, and other purposes; and it also consists of a new and improved process which is therein applied, and which the patentees denominate the dessicated process. The new and improved machinery comprises,—1, A stove, or inclosed chamber, in which the raw material is subjected to the regulated heat. 2, A new (dry action) cylinder machine, which consists of a large fluted cylinder, rotating upon its axis, and giving motion to a number of small-cylinders, or rollers (also fluted), and by which the large cylinder is partially surmounted; between the large and smaller cylinders the materials are subjected to a peculiar semi-crushing and semi-grinding process. 3, A mill, with a suitable hopper, for receiving the materials from (and partly prepared by) the cylinders. By this mill the materials are reduced to a fine lint-like fibrous or pile state; this completes the first stage, or dessicated process. The material thus prepared is then further treated as follows:—From the mill last mentioned the stuff falls into a cistern, or vessel, containing a suitable dilute, or chloriated water, in which it is steeped for a short time, and is thence drawn through an air-tight conduit into an exhausted steaming cylinder, which is fitted internally with disc agitators, and is also in connection with a boiler, or steaming apparatus. In certain cases, however, the steeping cistern may be dispensed with, and the materials from the mill may be run directly into the cylinder in which the chloriated or other liquid may be placed, and the first bleaching operation performed. The materials in the state of pulp are now subjected to a rapid motion and a volume of steam simultaneously, and are then removed into a second bleaching, or washing and cleasing, cylinder, in which they are finally dried, by exhaustion and pneumatic action. *Patent completed.*

1625. P. W. PAYRAS. *A system to protect all dry skins from vermin.* Dated May 30, 1862.

This invention consists in a process, the effect of which is to preserve, for an indefinite period, skins or hides of every description, whether dry or green, protecting them infallibly from the attacks of vermin, and, consequently, suppressing the operations of beating and salting. For this purpose, the patentee uses a mixed solution of sulphate and chlorure of zinc, marking 15 degs. by Beaume's aerometer, sometimes adding from eight to ten grains of arsenic for every quart of this liquid. The presence of the arsenic not being essentially necessary, he reserves the option of using or not using this body. From its simplicity, the application of the process is exceedingly easy, and does not necessitate the use of any plant, the cost of which need be taken into consideration. In fact a trough, or simply a stone vat, into which the liquid above mentioned is introduced, constitutes the entire plant. The operation is then effected by applying, with a brush or otherwise, a coating of the liquid on that part of the hide only which has adhered to the flesh. To operate more rapidly the hides may be immersed in the liquid, and this method is most preferable for hides with hair. *Patent completed.*

1626. J. GURRIN. *Telegraphic communication between separate buildings or parts of buildings.* Dated May 30, 1862.

This invention is not described apart from the drawings. *Patent abandoned.*

1627. R. NICHOLSON. *Improvements in the construction of lawn-mowing machines.* Dated May 30, 1862.

This invention relates to the delivery of the grass which has been cut by the cutting portion of the machine, and consists of a self-acting apparatus whereby the grass when cut is delivered with great facility. An endless belt passes over three rollers actuated by a shaft fitted with universal joints, the same being geared to a pair of bevel wheels on the roller or drum shaft of the machine. The grass as it is cut falls on the said endless belt, and a double clutch and lever handle fitted to the bevel wheels being provided, the apparatus is entirely under the control of the operator, who can, by moving the lever handle either to the right or left, deliver the grass to either side of the machine without stopping the same. *Patent abandoned.*

1628. J. LEON. *A stopping rein.* Dated May 30, 1862.

This invention consists in a curb or rein with an under throat piece for enabling riders or drivers to stop restive or run-away horses. This rein, which the rider holds with his little finger, is passed into a martingal with rings placed on each side of the horse's collar, then through two rings fixed on each side of the piston snaffle; this rein rises under the throat of the horse, and passes into two rings carried by the head stall. For horses harnessed to a carriage, the stopping rein is passed into two screw rings fixed to the seat, then through the rings of the snaffle and ring, and so as to pass into the rings of the headstall, and finally rests under the throat of the horse. This rein may be flat at the part held by the driver, and round at that part which is to move in the rings, which may be furnished with rollers or replaced by small pulleys. The conductor has only to pull the rein to produce a pressure under the horse's throat sufficiently great to prevent, if required, the air from entering his lungs; hence it will always be possible to stop a horse. *Patent abandoned.*

PROVISIONAL PROTECTIONS.

Dated Oct. 17, 1862.

2803. J. Summerton, Smethwick, agricultural machinist. Certain improvements in harrows for harrowing land.

Dated Oct 29, 1862.

2912. W. Clark, 53, Chancery-lane, engineer. Improvements in apparatus for ascertaining and recording the speed and distance travelled by vehicles, the flow and quantity of water, and other analogous purposes. (A communication.)

Dated Nov. 6, 1862.

3007. W. N. Hutchinson, Plymouth, Major.General. Improvements in apparatus or means for protecting the screw of steamers from becoming entangled with or fouled by ropes or other bodies.

Dated Nov. 12, 1862.

3047. T. Bradford, Cathedral-steps, Manchester, washing machine manufacturer. An improved clothes wringer and mangler, applicable to pressing the liquid from clothes in the process of washing and other pressing purposes.

Dated Nov. 13, 1862.

3055. G. W. Rendel, Newcastle-on-Tyne, civil engineer. An improved method of strengthening armour plates made of carbonized iron or steel.

Dated Nov. 20, 1862.

3120. J. W. Child, Halifax, engineer. Improvements in means and apparatus for working wool and other fibres.

Dated Nov. 21, 1862.

3131. J. Steart, St. James's-road, Blue Anchor-road, Bermondsey, manufacturer. An improved method of extracting the fibre from zostera marina and other aquatic vegetable productions.

Dated Nov. 24, 1862.

3155. W. Tatham, Rochdale, machine maker. Improvements in machinery or apparatus for preparing and spinning cotton, wool, flax, and other fibrous materials.

Dated Nov. 25, 1862.

3166. W. Longley, builder, Leeds. Improvements in machinery for making bricks.

Dated Nov. 27, 1862.

3177. A. A. Phéloux, 75, Rue Quincampoix, householder, and P. A. Paumier, 9, Rue Christine, merchant, Paris. A new atmospheric sailing propeller.

3179. T. Keyworth, Blue Court, Boston, Lincolnshire. Improvements in motive power machinery.

3183. D. Veerkamp and C. F. A. Van Trigt, 11, Mercers-terrace, Limehouse. Improvements in the treatment of old manufactured fabrics, in order to obtain useful fibrous products therefrom.

3185. W. Clark, 53, Chancery-lane, engineer. Improvements in gas burners. (A communication.)

Dated Nov. 28, 1862.

3186. J. Carbonell, 15, Passage des Petites Ecuries, Paris, merchant. Improvements in preparing, manufacturing, and washing the paper pulp derived from the esparto plant, and in apparatus connected therewith.

3187. W. A. Waddington, 44, Stonegate, York, pianoforte maker. Improvements in machinery for cutting wood.

3189. J. H. Johnson, 47, Lincoln's-inn-fields, gentleman. An apparatus for indicating the pressure of electric conductors in foreign bodies. (A communication.)

3191. J. Cresswell, Birmingham, undertaker, and E. T. Greves, gentleman. Improvements in the construction of hearses and funeral carriages.

3192. S. J. Browning, Portsmouth, engineer. Improvements in machines to be employed in brewing.

3193. W. Clark, 53, Chancery-lane, engineer. Improvements in the permanent way of railways. (A communication.)

3195. J. F. Delany and J. C. R. Okes, Victoria Foundry, Greenwich, engineers. Improvements in double cylinder expansive steam engines.

Dated Nov. 29, 1862.

3199. T. Blackburn and M. Knowles, Blackburn, machine makers. Improvements in looms for weaving.

3200. F. G. Taylor, Manchester, machinist. Improvements in washing machines.

3201. J. Crompton, Bolton, machinist. Improvements in machinery or apparatus for ploughing, harrowing, clearing, and drilling land.

3204. W. Clark, 53, Chancery-lane, engineer. An improved machine for cutting corks and other stoppers. (A communication.)

3205. F. Vacher, Parliament-street. Improvements in ornamenting playing cards.

3207. The Rev. H. Moule, Fordington, Dorset, clerk, master of arts. Improvements in locomotive engines, and in apparatus for generating steam for steam engines.

3209. J. Anderson, C.E., Royal Arsenal, Woolwich. Improvements in the manufacture of the tyres of railway wheels, and rails, switches, and crossings of railways.

3211. M. Henry, 84, Fleet-street, patent agent. Improvements in the manufacture of leather. (A communication.)

Dated Dec. 1, 1862.

3213. P. Bourne, Whitehaven, colliery viewer. Improvements in miners' lamps.

3215. T. Waller, Fish-street-hill, stove manufacturer. Improvements in stoves.

3217. R. Flude, Aylestone-street, Leicester. Improvements in looms for weaving narrow fabrics.

3219. J. Romer, Shipbourne. Improvements in the manufacture of bullion wire and metallic fine drawn wire.

3220. W. Clark, 53, Chancery-lane, engineer. An improved apparatus applicable as a pump, water meter, hydraulic motor, or a steam engine. (A communication.)

3221. P. W. Reuter, Buckland-crescent, St. John's Wood, merchant. The preparation of a new compound to be used for dyeing and printing purposes. (A communication.)

3222. E. D. Johnson, Wilmington-square, watch and chronometer manufacturer. Improvements in pocket watches.

Dated Dec. 2, 1862.

3225. H. Twelvetrees, Bromley, manufacturer. Improvements in apparatus for cleaning knives, forks, and boots.

3227. H. Twelvetrees, Bromley, manufacturer. Improvements in washing, wringing, and mangling machines.

3230. G. F. Blumberg, Cannon-street West, manufacturer. An improved method of, and apparatus for, producing designs in or on glass.

3231. J. Wheatley, 9, Glücks Strasse, Munich, captain. Improvements in the construction of ships of war, and in the manufacture of armour plates for ships, forts, and batteries.

3233. G. T. Bousfield, Loughborough-park, Brixton. Improvements in forming the permanent ways of railways. (A communication.)

3234. G. T. Bousfield, Loughborough-park, Brixton. Improvements in apparatus for discharging guns or ordnance. (A communication.)

3235. D. Graham, Edinburgh, commander. Improvements in steering and manœuvring ships or vessels, and in the apparatus employed therein.

3237. R. K. Cautley, Thorney, Cambridge, gentleman. Improvements in electro thermal baths. (A communication.)

3239. B. Browne, 49, King William-street, civil engineer. Improvements in the construction of knobs or handles of door locks, and in the mode of connecting same with the sliding bolts thereof for advancing and drawing back said bolts. (A communication.)

Dated Dec. 3, 1862.

3241. A. T. Becks, Birmingham, iron master. Improvements in machinery for cutting or shearing sheets or plates of metal.

3243. C. F. Claus, Fearnhead, chemist. Improvements in carboy hampers, and in the machinery or other means used for manufacturing the same.

3244. A. Morton, Arbroath, Forfar, engineer and machinist. Improvements in lawn-mowing machines.

3245. W. H. Browne, 29, Alwyne-road, Canonbury. Improvements in gas stoves.

3247. A. F. Eden, Threadneedle-street, optician. Improvements in apparatus for taking minute photographic pictures and magnified pictures of microscopic objects.

Dated Dec. 5, 1862.

3261. T. E. Blackwell, Orsett-terrace, Hyde-park, civil engineer. Improvements in barometers or instruments for measuring altitudes, or the pressure of the atmosphere or elastic fluids.

3268. F. Walton, Wood-street, City, manager. An improved article of wearing apparel for the neck.

Dated Dec. 6, 1862.

3272. J. and M. Craig, Kilmarnock, fire clay manufacturers. Improvements in apparatus for the manufacture of clay.

3274. W. McNaught, St. George's Foundry, Rochdale, engineer. Improvements in machinery for washing and drying textile fabrics and materials.

3276. J. Burchall, St. Helen's, Lancaster, merchant, and E. Borrows, Sutton, engineer. Improvements in propellers for ships and other navigable vessels.

3278. R. McClintock, Dublin. Improvements in carriage axles.

Dated Dec. 8, 1862.

3286. R. A. Brooman, 166, Fleet-street, patent agent. Improvements in kneading machines. (A communication.)

3288. C. Sanderson, Sheffield, steel manufacturer. An improved mode of manufacturing bands for driving machinery, lifting weights, and other analogous purposes.

3290. J. Hilliar, Balsall Heath, Worcester, manager. Improvements in hinges, joints, or connections, and in applying them, parts of which improvements may also be employed for constructive and decorative purposes.

Dated Dec. 9, 1862.

3296. V. Mirland, Frameries, Belgium, manufacturer. Improvements in manufacturing paste with the dried pulp of rhubarb to be used as preserve.

3298. W. Clark, 53, Chancery-lane, engineer. Improvements in photographic apparatus. (A communication.)

3300. G. Jeffries, Golden Ball-street, Norwich, gun maker. Improvements in breech-loading firearms.

3304. W. E. Newton, 66, Chancery-lane. Improvements in firearms. (A communication.)

Dated Dec. 10, 1862.

3310. S. B. Whitfield, Birmingham, manufacturer. Improvements in the dovetail joints used in metallic bedsteads and other articles of like manufacture.

3314. W. A. Turner, Lawrence Poutney-lane. Improvements in machinery for cutting or paring starch.

Dated Dec. 11, 1862.

3320. J. R. Breckon, Darlington, accountant and manager, and T. Douglas, Peases West Colliery, Crook, Durham, colliery viewer. Improvements in the manufacture of fire bricks and other articles usually made from fire clay.

3322. R. Clark, Langloan, North Briton, engineer. Improvements in machinery or apparatus for boring, winding, and lifting for mining purposes.

3324. J. Imray, 65, Bridge-road, Lambeth, engineer. Improvements in apparatus used for mixing and kneading.

3226. T. E. Vickers, Sheffield, in the county of York, manufacturer. Improvements in the construction of ordnance.

NOTICES OF INTENTION TO PROCEED WITH PATENTS.

From the *London Gazette.*

2210. C. Culling. Firearms.

2219. E. Hall. Means or apparatus for preparing foreign grain for grinding.

2231. Sir J. S. Lillie. Carriage-ways and foot-ways.

2233. A. J. Moreau and A. E. Ragon. Mode of, and apparatus for, treating bituminous and carbonaceous substances for the purpose of obtaining the various products, volatile liquid and solid, which they contain, and also in the treatment and application of such products.

2234. A. J. Moreau and A. E. Ragon. Manufacture of gas and coke.

2238. H. Fenton and W. Stubbs. Telegraph wires.

2251. W. Macnab. Steam boilers.

2250. C. M. Westmacott. Cements.

2262. C. Sengry. Pipes.

2266. J. Dickinson. Obtaining sodium.

2269. J. R. Tussard and F. C. Tussard. Treatment of representations formed from wax.

2273. H. Twelvetrees. Rat and mice traps.

2280. A. Walker. Instrument to determine or ascertain the depth of water and the distance a ship has run.

2285. W. Beatson. Manufacture of stoves.

2290. W. J. Curtis. Ascertaining the fares and earnings of public vehicles.

2292. J. Hearn. Apparatus or appliances for raising sick or bedridden persons.

2299. J. Barclay. Manufacture of nails.

2301. T. Carvin. Screw propellers.

2304. J. Carter and J. Maher. Construction of power looms.

2305. J. H. Johnson. Electro-magnetic time-keepers. (A communication.)

2307. H. Garside. Machinery or apparatus for marking, etching, or engraving on cylindrical and other surfaces.

2314. J. Cimeg. Depositing silver and other metals on fabrics and other materials.

2317. J. Brière. A continuous self-acting condenser.

2321. V. F. Cleuet. Liquids.

2322. H. Dembinski. Motive apparatus and processes proper for giving to it a continuous motion and unlimited strength.

2354. W. J. Hoyle and J. Proven. Supplying lubricating matter to the cylinders of steam engines.

2344. W. Barrett. Casting railway sleepers and chairs.

2346. J. Mackay. Manufacture of soap powder.

2357. M. K. Angelo. Manufacture of shell-lac.

2361. M. J. Haines. Driving bands or straps.

2398. J. Davis. Manufacture of spoons, forks, and similar articles. (A communication.)

2402. P. W. Mackenzie and S. W. Smith. Vehicles to be propelled by the rider.

2425. J. Mosheimer. Machinery for amalgamating gold and silver or the ores.

2457. W. E. Newton. Lamps. (A communication.)

2467. W. A. Richards. Fastenings.

2515. J. Bower. Railway sleepers.

2551. W. E. Newton. Watches or time-keepers. (A communication.)

2579. P. L. Forrestier. Photographic albums.

2638. R. Griffiths. Contruction of iron ships.

2776. E. Molyneux. Carriages.

2858. H. Rée. Exercising the human body.

2981. J. Place. Looms.

3157. J. Moule. Deodorizing mineral oils and hydrocarbons.

3163. G. Henderson. Steam engines. (A communication.)

3215. T. Waller. Stoves.

3236. A. P. Charles. Candles and nightlights.

2238. H. J. Simlick. Manufacture of cigar and pipe lights.

3247. A. F. Eden. Taking minute photographic pictures.

3250. J. Grant. Construction of turn tables.

The full titles of the patents in the above list can be ascertained by referring back to their numbers in the list of provisional protections previously published.

Opposition can be entered to the granting of a patent to any of the parties in the above list who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

LIST OF SEALED PATENTS.

Sealed December 19, 1862.

1850. W. Hargreaves and G. H. Leather.	1891. A. A. Croll.
1851. T. Carr.	1897. G. H. Hulskamp.
1868. J. Whitham.	1898. J. Garnier.
1869. G. Turner.	1901. J. Tatham.
1876. J. Parkes.	1902. J. Petrie.
1882. J. Watson.	2585. C. Mertens.
1888. R. A. Brooman.	2693. T. Keech.
1889. A. H. Martin.	2754. C. McCarthy.
1890. I. Holden.	2805. J. and G. Davies.

Sealed December 23, 1862.

1905. J. Wall and T. Dodd.	2080. A. Fournier.
1906. W. Thomas.	2096. A. Vignon.
1922. J. M. Dunlop.	2121. T. Sagar and J. Rocliff.
1943. J. Miles.	2237. H. B. Barlow.
1973. A. Gilbey.	2627. C. D. Abel.
1976. C. F. W. Rust.	2667. G. J. Firmin.
2009. J. H. Johnson.	2736. H. A. Marinoni.
2042. R. Dunn.	2935. G. Haseltine.
2064. W. E. Newton.	

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

2883. G. S. Goodall.	2906. J. H. Johnson.
2898. G. and J. Collier.	2950. T. S. Truss.
2900. W. Henderson.	2975. T. S. Cressy.
2496. W. E. Newton.	2892. J. Fairclough.
2896. J. Willcock.	2909. S. Plimsoll.

PATENT ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2902. J. Chesterman.

LIST OF SPECIFICATIONS PUBLISHED

For the Week ending December 26, 1862.

No.	Pr. s.	Pr. d.	No.	Pr. s.	Pr. d.	No.	Pr. s.	Pr. d.	No.	Pr. s.	Pr. d.	No.	Pr. s.	Pr. d.	No.	Pr. s.	Pr. d.
1362	1	0	1422	1	4	1437	0	4	1451	0	4	1465	0	4	1479	0	4
1379	2	10	1423	0	4	1438	0	8	1452	0	4	1466	0	4	1480	0	8
1380	2	4	1424	0	8	1439	1	4	1453	0	8	1467	0	8	1481	0	4
1397	1	0	1425	0	10	1440	0	4	1454	0	4	1468	1	4	1482	0	6
1411	0	4	1426	0	10	1441	0	4	1455	0	10	1469	0	8	1483		
1412	0	8	1427	0	8	1442	0	4	1456	0	8	1470	1	2	1484	0	4
1413	0	4	1428	0	4	1443	0	8	1457	0	10	1471	0	4	1485	0	8
1414	0	8	1429	0	4	1444	0	4	1458	0	4	1472	0	10	1486	0	8
1415	0	4	1430	0	4	1445	0	4	1459	0	10	1473	0	6	1487	0	4
1416	0	10	1431	1	0	1446	0	4	1460	0	4	1474	0	6	1488	0	8
1417	0	4	1432	2	4	1447	1	0	1461	0	6	1475	0	4	1489	0	4
1418	0	4	1433	0	4	1448	0	10	1462	0	4	1476	0	4	1490	0	10
1419	0	10	1434	0	4	1449	0	4	1463	0	4	1477	0	8	1491	1	4
1420	0	4	1435	0	8	1450	0	8	1464	0	4	1478	0	4	1492	0	8
1421	0	8	1436	0	4												

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THE MECHANICS' MAGAZINE.

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